AVIATION AND AIRCRAFT JOURNAL

OCTOBER 31, 1921 VOL. XI. NO. 18

Member of the Audit Bureau of Circulations

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THE GARDNER, MOFFAT COMPANY, Inc., *Publishers*

HIGHLAND, N. Y.

225 FOURTH AVENUE, NEW YORK

SUBSCRIPTION PRICE: FOUR DOLLARS PER YEAR. SINGLE COPIES FIFTEEN CENTS. CANADA, FIVE DOLLARS. FOREIGN, SIX DOLLARS A YEAR.

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ISSUED EVERY MONDAY. FORMS CLOSE TEN DAYS PREVIOUSLY. ENTERED AS SECOND-CLASS MATTER NOV. 22, 1920, AT THE POST OFFICE AT HIGHLAND, N. Y., UNDER ACT OF MARCH 3, 1897.

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AVIATION AND AIRCRAFT JOURNAL

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Vol. XI | OCTOBER 31, 1921 | No. 18

Aviation in China

THE article on aviation in China which is contributed to this issue by an officer of the Chinese air service will perhaps come as a revelation to many of our readers. The steady, though quiet progress the Celestial Republic has for some time been making in aeronautics is little known in this country, so that a detailed record of its aeronautical activities may be the cause of genuine surprise to those who still think of China in terms of pagodas and sampans.

Nothing could better illustrate the attitude of modern China toward mechanical appliances and progress in general than the up to date manner in which aviation is being handled by our Oriental friends. Through its participation in the peace conference China was enabled to become a signatory to the International Air Convention, and this it has ratified, promulgating at the same time the legislation required for its enforcement. An aeronautical department was then created for the control of all air activities and various schools were established for the training of pilots, air mechanics, and even airdrome managers. The latter provision, together with the establishment of an 800-mile passenger and mail air route, between Peking and Shanghai, sufficiently shows the strides China is making in aeronautics.

While at present the main effort is brought to bear on utilizing the men and machines America and Europe afford to aeronautical enterprise, China is likewise striving to create its own sources of aircraft supply together with the men required to take intelligent charge of them. Thus, after a certain preparatory period, China expects to become entirely self-sufficient in aviation materiel as well as in personnel.

That this program may take some time before it will be brought to its logical conclusion is obvious. In the mean time China's progressive attitude offers American aircraft manufacturers an excellent opportunity for making their products better known in the Far East, the more so as numerous Chinese received their flying training in the United States.

French Air Power

IN view of the lengthy controversy which occurred in this country relative to the advisability of creating a unified air force and a separate air department, it is interesting to read of the efforts made in France along this line of thought. There is a strong movement on foot in the French Republic for bringing about the merger of the two fighting air forces into a single service which would be co-equal in administrative and strategical matters with the army and navy.

Those well versed in problems of French national defense realize that France is more in danger of aerial attack than is generally realized by the public. The swiftness with which aircraft move, coupled with their ability of heading straight for the objective regardless of geographical obstacles, makes of the aerial arm a striking force of the first magnitude. On the Old Continent, furthermore, the short distances—relative to American conditions—which separate the various countries from one another, greatly enhance the chances of a successful attack from the air.

Now, since this is just the condition which prevails in Europe, it is quite natural that France should make strenuous efforts to prevent its being outdistanced in the command of the air it now holds. Men well known in aeronautics, such as André Michelin, Count de la Vaulx, Captain Fonk, now a deputy in parliament, and others are touring French cities in an attempt to arouse interest in the cause of aviation among the people.

The same plan for a ministry of defense which is being discussed in this country is under consideration in France. The military and naval establishments are opposing any such reorganization for the usual reasons, just as they are hostile to any amalgamation of the military and naval air forces. It would nevertheless seem that a ministry of defense, with under-secretaries in charge of army, navy and air force, will eventually be found in all countries to be the best solution of the problem of national defense. That many prejudices will have to be overcome before such a solution is adopted seems equally evident.

Plain talk about the aerial arm protecting the coasts, the colonies and the navy is refreshing. It is not too much to expect that France which has always led in aeronautical development may once more show the way by organizing its air force so well that it may be a model for other countries.

Airplanes and Kings

NOTHING perhaps could better illustrate the manner in which the airplane has become an every day vehicle—which means a safe machine, after all—than the many instances where royalty have taken to the air.

King Albert of Belgium, after having been a dauntless soldier and a leader of his people through adversity, was also the royal pioneer in flying. His trips by airplane from Brussels to Paris and to London are so frequent as to excite little comment among his people.

The King of Spain, who is also a great sportsman, likewise uses airplanes in his numerous trips.

It remained for Charles, ex-emperor of Austria, to put the airplane to a new use—that of starting a rebellion in his behalf by flying into the country which he hopes to rule. If as it seems, the Allies are going to thwart Charles Hapsburg's ambitions by interning him in a safe place, perhaps they will see to it that police airplanes shall prevent a renewal of his aerial exploit.

Lessons of the Gordon Bennett Balloon Race

By Ralph Upson

Pilot of Balloon "Aero Club of America"

Even in these enlightened days one sometimes hears the question "What is the use of free-ballooning?" To this I feel like countering "What is the use of golf, yachting, poetry, music, polar exploration, "relativity" and a host of other examples from the whole world of sport, art and abstract science?" Ballooning does not claim to be any more than these, but it is the most satisfying combination of the three that was ever invented by man.

My object here is simply to point out various specific results which have accrued from the International Gordon Bennett Balloon Race just contested from Brussels.

Meteorology. At least three meteorologists took actual part in the race, and unprecedented attention was given it by the weather bureaus of the various countries. The dominating

COURSE OF BALLOON "AERO CLUB OF AMERICA" JUST BEFORE LANDING AT POINT MARKED WITH ARROW. CROSS INDICATES BARDSEY ISLAND

factor in the weather at the time of the race was a pronounced "high" which caused strong surface winds from the east decreasing at upper levels, with only a slight shifting of direction.

Now these "anti-cyclonic" conditions happen to be the most unreliable in many ways of all the ordinary formations. Competent meteorologists still differ among themselves as to the inside causes and workings of a "high", and forecasts of what it will do are notoriously inexact. This is mainly due to incomplete knowledge, and there is no better way of adding to this knowledge than by studying the situation at absolutely first hand as one can, in a free balloon.

Multiply this opportunity by fourteen, the number of balloons in the race, all making independent observations and the total value of the race may be readily appreciated.

The meteorological results from a scientific standpoint have not yet been made public but it is fairly clear that they will include interesting light on the following subjects:

Structure of wind currents in a typical high.

The extent to which these currents may be regular or irregular in nature.

Effect of clouds, bodies of water, etc.

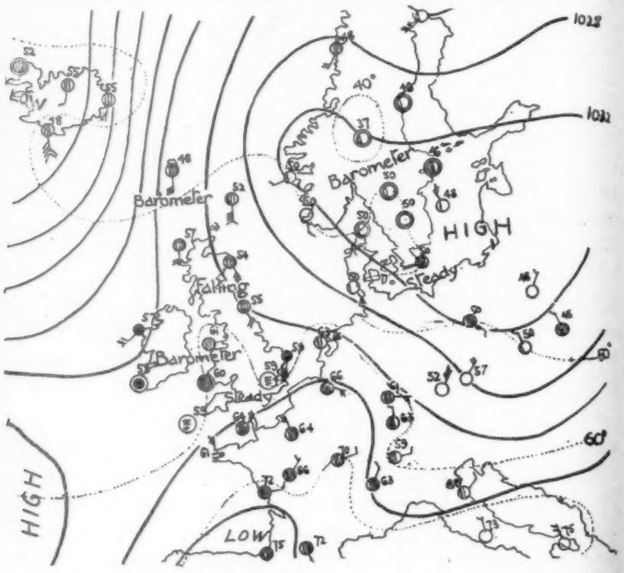
Nature of conditions in a calm area, where the barometric gradient is practically zero.

Dynamics of the wind. How a given air mass may be transferred from one system to another, and the changes that it undergoes.

Instruments. The free balloon is a wonderful medium for the development of refined instruments and methods of observation. This is because it provides such a steady wind-free platform where the essential principles of a new device may be accurately gauged without all the complications of design which would later be required for practical use in power driven aircraft.

Among our own equipment we had several new instruments which together almost revolutionized the navigation and control of a free balloon. The one which will be most readily available for general aeronautical use was an instrument which we called the "feeler", although more scientifically it should be called a *forcemeter*.

This instrument measured directly and instantaneously the amount of unbalanced force acting on the balloon at any



WEATHER MAP OF WESTERN EUROPE ON THE EVENING OF SEPT. 19, 1921, THE SECOND DAY OF THE RACE

given moment. In all the older types of instruments for a similar purpose it was necessary to wait for some obvious movement of the balloon before the force which caused it could be even approximately counteracted. With the "feeler" however the amount of the force was known before waiting for its integrated effect on the balloon. It could be counteracted at once with ballast or gas, or if desired its variations could be watched with full confidence that the balloon could never get out of control.

The "feeler", in somewhat modified form, will be a great improvement on the statoscope for all types of lighter-than-air craft, and should be a valuable aid also in the control of airplanes. Full details of this instrument will be published at a later date.

An improved type of "navigator" made by the Pioneer Instrument Co. enabled us to plot our course with great accuracy. This instrument combined the functions of compass, speedometer, sounder, nephoscope, and range finder (distance gauge).

In the securing of data on wind movement we were greatly indebted to the U. S. Rubber Co. for the use of the best rubber pilot balloons which we have yet tested. For the first time, we were able to use a captive pilot balloon successfully, which permitted a continuous observation of conditions at different altitudes.

Performance. The circumstances surrounding the start of the race are of considerable interest in their relation to practical air traffic. On Sept. 18, the day of the start, the wind attained approximately 40 m.p.h. at times. During the whole day, not a single airplane passed between England and the continent. Only one ventured to ascend at all and had to land again before crossing the channel. According to newspaper records, it was the first time since March that there had been such a total cessation of flying. Yet fourteen big balloons, entirely without power-plant, were inflated in the open and sent off without serious mishap. Such a performance cannot help but augur well for the practical future of all lighter-than-air craft.

Almost equally to be noted was the success with which the balloons were navigated, at first through strong but fickle winds, later in practically a calm, and always with large bodies of water in close proximity. It was probably the most perilous race that has ever been run, yet only one balloon was forced to descend on the water.

Of the three balloons which attempted the crossing of the Irish Sea, two were American; and the third American balloon would certainly have done so also if he had had the opportunity.

Future Contests. This race has showed up very clearly the various mistakes and hazards of the game. I put the item of mistakes first because most apparent elements of hazard or chance actually turn out to be errors of judgment of some kind. Thus B. Von Hoffman from St. Louis was leading the whole field, but ran out of ballast. "Hard luck" one may well say; but then he should not have been so extravagant of ballast. W. T. Van Orman from Akron was the leader of the balloons which took the southern route, but this was not the route which held the greatest possibilities. On my part I sacrificed a little too much speed for direction even though I had with me one of the most competent meteorologists in the world.

But call it luck or judgment as you like, the fact remains that to be consistent winners we will have to be consistent starters. In other words quantity is something of a factor as well as quality. In particular the individual should have a full sized balloon and our country should always have a full team of three baloons in future international races.

Experiences in the Gordon Bennett Balloon Race

In connection with the above article the following account of the experiences of the balloon "City of St. Louis", piloted by Bernard Von Hoffman, with J. S. McKibben as aide, is of interest. EDITOR.

The week preceding the balloon race the weather conditions were such as to make a flight into Russia an almost inevitable fact in order to ensure the safety of the contestants in the balloon race.

The Federation of Aeronautics saw fit to describe the 25 degrees of altitude as a point which if passed would form the boundary for which credit for distance could be given the contestants. With conditions such as these all the contestants prepared themselves for a possible flight into the regions of eastern Poland or of western Russia.

These weather conditions suddenly changed however with the day preceding the race. The wind was such as to make a flight for England and possibly Ireland probable.

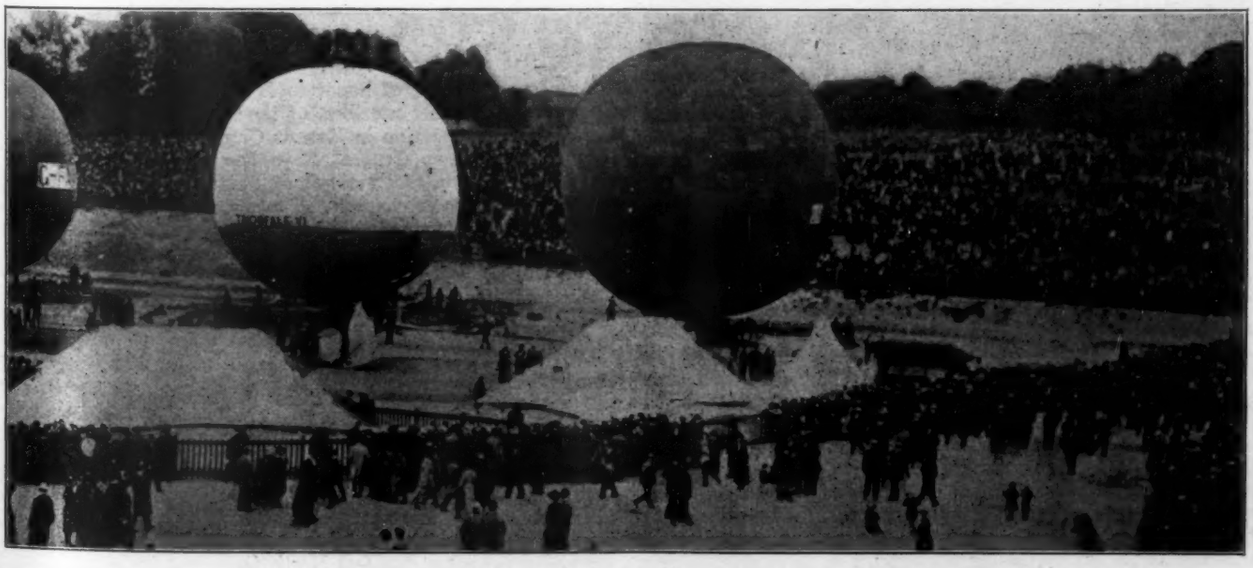
The day of the race broke with strong surface winds, approximately 40 m.p.h. raged on the ground, which made the following of the balloons an extremely difficult and even a precarious undertaking. Had it not been for the shrewd foresight and remarkable organization of the Belgian Aero Club in cooperation with the Military Forces, a postponement of the race would have been necessary.

By noon the balloons were ready to sail, and waiting only the signal of the starters to float merrily along with the wind.

Promptly at 4 o'clock, the first balloon, representing England, left the ground with the cheers of thousands of people who were lining the field.

After consultation with C. G. Andrus, the meteorologist of the American team, who as aide to Ralph Upson of the balloon "Aero Club of America", furnished us with details of the meteorological conditions, Mr. McKibben and myself decided to try for a wind which would carry us over the south of England and Wales across the Irish Sea and into Ireland.

At 6 o'clock prompt we left the ground climbing rapidly to an altitude of 1500 meters where we encountered a wind of 35 m.p.h. carrying us directly west north west. Passing with the rapidity of a fast express over the battlefields of north western Belgium we soon found ourselves within hearing of the roar of the ocean, and promptly at 8 o'clock we passed directly over the towns of Ostende and Zee-Brugge, which played such an important part in the war. A few minutes later and all sight of land had disappeared, and only occa-



START OF THE GORDON BENNETT BALLOON RACE AT BRUSSELS, SEPT. 18, 1921

Photo Underwood & Underwood

sionally could we see the lights of a passing steamer, and the incumbent flash of the lighthouses along the coast.

Two hours later we had reached the English coast and sailed smoothly but swiftly across the mouth of the Thames River into England. All night we drifted on over the kaleidescopic fields of England, and at mid-night we saw the distant light of London to the south of us.

Early morning found us drifting across the Malvern Hills of western England and we knew that it could not be long until we should again reach salt water. Accordingly at 8 o'clock with the ocean distant to the west of us, we dropped down into a sheltering valley—so close that our drag rope trailed the ground, and we ascertained from some of the country men and women that we were 5 miles north east of Aberystwith which lies on the southern extremity of Cardigan Bay and the Irish Sea. Ten minutes later and we had reached Cardigan Bay, and were racing out to sea once more.

At this time we had eighteen bags of ballast, and were moving at a rate of 25 m.p.h. It was 100 miles to the Irish Coast moving as we were in a west north westerly direction, so after a careful survey of weather conditions we decided we could reach the Irish Coast early in the afternoon, and drift to the western boundary to a victorious conclusion of the race.

However, at this stage, fortune turned against us and with every mile and every minute we went on, we found the wind slowly but surely diminishing in speed. At 11 o'clock in the morning we were approaching the rugged promontory which fringes the northern edge of Cardigan Bay and every effort was made to reach this promontory. We knew at this time that it was extremely doubtful whether the wind would continue long enough to permit us to reach the Irish Coast, and we decided, if possible to try for the promontory to the north of us and to land there. For 15 minutes we jiggered around at different altitudes for the most favorable wind in rising, for such a wind we broke through the tops of the clouds about us and there, at approximately 8 miles south west of us McKibben spied another balloon.

We were out to win the race, and to bring the cup back to St. Louis, which until a year ago was acknowledged as the center of ballooning in the United States. If we landed on the promontory, and the Swiss balloon as we knew it to be from its appearance, made the Irish Shores, we would be beaten. It was then we decided to take a sportsman's chance in crossing the Irish Sea and making for Ireland. We knew that we must have as much or more ballast than the Swiss pilot for our balloon was the lightest in the race by several hundreds of pounds, and weather conditions had been almost ideal up to that time for a long flight.

Accordingly we dropped low to the water where we knew the current of air with the most westerly direction to be, and then half an hour later we had overhauled the Swiss balloon which appeared higher than us and directly to the South. Seeing that we were making better speed the Swiss dropped into our current and it was a neck and neck race from then on. Soon the enveloping clouds again hid the Swiss from our sight, and slowly and with ever diminishing rapidity we drifted toward the west north west.

At 4 o'clock in the afternoon we were within the sound of the Irish Coast. We could hear the lap-lap of the waves upon the shore, we could hear the shouts of men, the rumble of wagons over the roads, the barking of dogs, and numerous other sounds which denoted land. At this time we were proceeding directly north, yet try as we might for a westerly wind, there was none, and every wind latitude tended to bear us more and more toward the east. Our balloon was getting low—we had but four sacks of sand left. We passed directly over a steamer and a lightship and we knew that should we care to drop in the water we could soon be rescued, but the rules of the race were such that if we landed in water we could be disqualified in the race, and another thing, that the Swiss must be a few miles to the south of us, so we decided to fight it out to the last ounce of ballast. Slowly we drifted northward and directly off Dublin Bay we turned more easterly. Off the east of us we saw two islands yet to make this was impossible due to the northern trend of the winds. From a study of the charts we had with us we knew that once these islands were passed a landing in water would be inevitable as land lay 70 miles or more in the direction we were proceeding, and at the rate we were traveling it must take at least 10 hours or more to reach land.

At 5 o'clock in the afternoon we spied two steamers and let the balloon sink slowly toward the water. We dropped a Holmes distress light overboard. One of the ships turned toward us and for the moment we thought we would be rescued, but the ship again turned away, and soon both steamers had disappeared toward the east.

Every effort was bent to stay in the air as long as we could. We pulled in our drag rope, a rope 300 ft. long, and weighing 100 lb. and this we cut up into small lengths to use as ballast. Soon two of our remaining three bags of ballast were gone, and the drag rope also, and we decided to throw overboard all our dispensible food, water, instruments and unnecessary clothing.

At 8 o'clock all our ballast was gone and we cut off all ropes on the basket which were not necessary to hold the basket to the balloon, and used them as ballast. Slowly we found ourselves descending into the sea when that fortune which had been so adverse, now favored us with a warm sea breeze which heated the gas and checked our fall, but this was only momentary.

At 9 o'clock we again began a slow descent, when off to the west of us we saw a semi-circle of black smoke and two white lights and a red. We knew this was our last chance for safety as we were already north of the steamship line lying between Dublin and Liverpool. As the balloon slowly sank downward we released our last Holmes signal light, and a moment later we were a few feet above the ocean. Mr. McKibben was at this time standing on the basket and the two of us were bracing ourselves for the shock as we should hit the water. We hit the water sooner than we expected and Mr. McKibben was momentarily stunned by a blow on the head by the load ring and thrown into the water.

Released of his 160 lb. of weight, the balloon shot upward at a terrific speed, and should its ascent not be checked it must rise to a height of 5 miles or more. I did the only thing that was left—pulled the rip cord which tears a complete panel out of the upper side of the balloon. I heard the rush of escaping gas and the split of the cloth as the under half of the balloon whipped up against the top. The balloon formed a parachute and descended into the water, no harder than if I had jumped from the top of a table.

Releasing myself from the wreckage I swam toward the boat and half an hour later the life boat from the ship which had turned out to be the steamship Thistle picked up Mr. McKibben and myself and conveyed us to Heysham Harbour, England. The balloon was lost and the last we saw of it was floating upon the water like a giant mushroom. Because of the danger from the enclosed remaining gas we could not prevail upon the steamship to rescue it.

Air Mail Service to Honor Marshall Foch

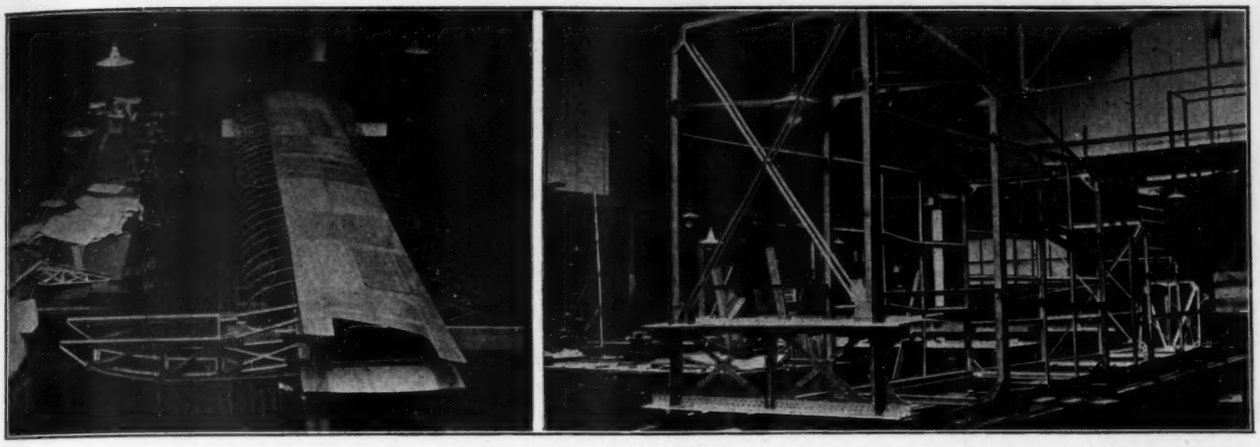
As a special mark of honor to Marshall Foch, who will be the guest, with other notables, of the American Legion at the third annual convention in Kansas City, Mo., from Oct. 31 to Nov. 2, Postmaster General Hays has arranged to have an Air Mail squadron of six airplanes fly to Kansas City on one of the days of the convention. The ships of this squadron will be regular mail planes mobilized at Omaha from stations on the trans-continental route—from New York to San Francisco—and will fly in formation from Omaha to Kansas City.

Air mail service has been authorized between Kansas City and Omaha for the duration of the American Legion Convention.

Meteorological Station at Carlstrom Field

The Signal Corps is establishing a meteorological station at Carlstrom Field, and Sergeant John M. McClelland has been sent to the station to have charge of this work. The various instruments and implements are already on hand and are being set up under Sergeant McClelland's direction. The station is located at the Old North Gate, and the guard house there is being used in connection with the work.

A New Zeppelin-Staaken Monoplane



LEFT: RIGHT HAND WING AND ENGINE BED OF THE NEW ZEPPELIN-STAAKEN COMMERCIAL 8-SEATER. RIGHT: FRAMEWORK OF THE FUSELAGE

The Staaken plant of the Zeppelin company has under construction a new type of all-metal monoplane designed by Dr. Rohrbach which is to be a twin-engined commercial carrier. The construction of the machine generally follows the lines of the Model E.4.250 four-engined monoplane which was described in the Oct. 3, 1921 issue of AVIATION AND AIRCRAFT JOURNAL, although it differs from the latter machine in several details.

Perhaps the most remarkable change is to be found in the engine nacelles. As may be seen in one of the accompanying illustrations, the engine bearers project much farther ahead of the leading edge of the wings, than on the Model E.4.250. While no outline drawings of the new monoplane are available at present, it appears that this peculiar engine mounting answers the purpose of having the propeller disks overlap the nose of the machine so that the two thrust lines would be at a minimum distance from the longitudinal axis of the airplane. The control movements required for correcting the couple introduced when flying on one engine would thus be kept within small limits.

From the preliminary data on hand it is evident that Dr. Rohrbach, in his latest design, has made a considerable—and apparently successful—effort to overcome some of the much criticized features of Model E.4.250, chief of which were the low ratio of useful load to weight empty (0.399) and the extremely high landing speed (80 m.p.h.). According to the design data, the twin-engined Zeppelin-Staaken monoplane will have a ratio Useful Load/Weight Empty of 0.758, and the landing speed will be 60 m.p.h. Of course, these figures are subject to confirmation by flight tests, but if the latter bear them out, the advocates of all-metal construction will have a strong argument in favor of their contention that the great net weight of metal airplanes is not inherent, but merely due to lack of experience, with this type of construction.

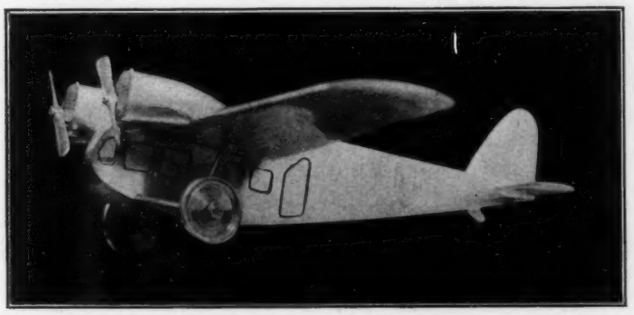
While the wing structure of the new Zeppelin-Staaken does not seem to differ in principle from that of the four-engined model, the framework of the fuselage, which is also illustrated above, shows a considerable departure from previous practice. The heavy sheet duralumin transverse frames which were used on the Model E.4.250 in order to provide for a clear passage throughout the length of the fuselage, have been displaced on the twin-engined model by a more orthodox construction. The fuselage is built up of channel and corner section longerons and cross members which are riveted together and cross-braced in the bays which occur outside of the space reserved for the cabin.

That this system of construction is responsible for a considerable saving in weight is obvious. How the strength of the fuselage will compare with that of the four-engined model is open to conjecture since nothing is known as to how the fuselage will be braced to carry the wings, nor how the portion containing the cabin will be stiffened.

The twin-engined Zeppelin-Staaken will be fitted with a cabin affording accommodation to six passengers and the cockpit will have two seats, for pilot and mechanic. Following are the design specifications of this machine.

Specifications of the Zeppelin-Staaken Twin-Engined Airplane

Span	62 ft. 8 in.
Overall length	33 ft.
Maximum height	11 ft.
Engines	2—120 hp. Argus.
Weight empty	3,190 lb.
Weigth loaded	5,610 lb.
High speed (2 engines)	120 m.p.h. (designed).
High speed (1 engine)	100 m.p.h. (designed).
Landing speed	60 m.p.h. (designed).
Range	5—6 hr.



WIND TUNNEL MODEL OF THE NEW TWIN-ENGINED ZEPPELIN-STAAKEN MONOPLANE

The general appearance of the new Zeppelin-Staaken monoplane may be gathered from the wind tunnel model illustrated above.

R.38 Memorial Fund

The Council of the Royal Aeronautical Society has decided to establish a memorial fund to those lost in R.38 and previous airships. With the income derived from the capital sum raised it is proposed to encourage investigations into problems connected with airships or allied subjects; the results of such work to be embodied in papers to be read before the Royal Aeronautical Society. It has been decided that the memorial shall take this form as it is believed that this offers the best means of carrying on the work of those who have perished in the cause of airships.

Contributions should be forwarded to The Secretary, Royal Aeronautical Society, 7, Albermarle Street, London, W. 1, England.

Multi-Engined Commercial Airplanes

By Donald W. McIlhiney

That the transport airplane of the future on the principal airways will be a super-giant is the general opinion of today. Due to an unfortunate world financial depression, very little has been done to develop such machines. Except on a few favored airways, even the two- or three-engined machines have not been employed. It is generally admitted that this condition is due to a lack of business rather than to any defects in the class itself. It is instructive, however, to see what has been done to date.

The accompanying table gives the principal specifications of forty-four models of multi-engined commercial airplanes. By commercial, are meant machines with cabins, where passengers are carried, or designed for mail or freight carrying. The term airplanes is here used in a general sense. The averages of the various features of the individual machines are given at the bottom of the table on the line marked: Large Machines. The average horsepower given is the average total horsepower, not the average per engine; the figure in the table is the power of the individual engines. The average F. M. (Figure of Merit)* is the average of the individual F. M.s and not the F. M. of the average machine, which naturally has a different value.

As the table contains, as far as practicable, all the principal machines in this class, data are given for many machines that are relatively unsuccessful. In order to draw any conclusions regarding the trend of design it is well to take the better models for study. A convenient group is that containing machines whose F. M. is greater than the average of the entire table. This group will be referred to in what follows as the selected large machines..

There are twenty-four different engines used in the forty-four machines comprising the entire table. The engines used in more than one instance are as follows: 9 Liberty 12, 4 Salmson Z9, 4 Isotta Fraschini V6, 3 Napier Lion, 3 Maybach, and two each of the following, Curtiss OX5, Hall-Scott L6 and Hispano-Suiza 300. In the selected large machines there are eleven engines, as follows: 4 Liberty 12, 2 Napier Lion, 2 Salmson Z9, 2 Isotta-Fraschini V6 and one each of the following, Packard 1-A-2025, Rolls-Royce Eagle VIII, LeRhön 80. Lorraine Dietrich 370, Maybach 260, B.M.W. 3a and the Bréguet-Buggati combination.

The numbers of models produced in the various years show a steady decrease as shown by the following figures; 1919-20, 1920-14, 1921-7; designs announced but not yet completed—3. The high number after the war may be explained by an imperfect understanding of the situation by the manufacturers, and the decrease since by the continued existence of the 1919 models and also lack of incentive. The proportion of selected large machines to the total in the different years is as follows; 1919—40 per cent, 1920—28.6 per cent, 1921—42.9 per cent and of those not yet built—66.7 per cent. This somewhat curious situation may be partially explained as follows: In 1919, the factories and designing staffs were still working and intact, and in addition several fine bombers which had been produced too late for service, were converted for commercial use. By 1920, a large number of aircraft factories had either been shut down or diverted to other products, and the fine designing staffs either entirely disbanded or were greatly cut down. Also that year must be regarded as largely experimental. Today, although only a few machines are being laid down or designed, the designers have a better idea of what a commercial machine should be. In the future, due to a loosening of credit and an increase of air transport, one may expect to see a recrudescence of large commercial airplanes and moreover, expect to find them larger than similar present machines.

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* F. M. $= \dfrac{V_{90\ per\ cent\ max} \times \text{Pay Load} \times \text{Range}}{V_{Landing} \times \text{Power}}$

* Aviation and Aircraft Journal for Sept. 26, 1921.

There are eleven seaplanes in the table, two being float seaplanes and the remainder flying boats. There is only one, a flying boat, in the selected list; however, it is only fair to count in the Ricci R-1 float seaplane, as its F. M. is only one point below the dividing line. Italy has a larger proportion of seaplanes than any of the other countries, having four out of seven. As regards wing arrangements there are five triplanes, six monoplanes and thirty-three biplanes. It is interesting to note the growth in favor of the monoplane, in 1919, 5 per cent were monoplanes, 14.3 per cent in '20 and '21 and 66.7 per cent of those not yet completed. The proportion in the selected list is still more striking. In 1919 there were no monoplanes, in '20—25.0 per cent, '21—33.3 per cent and 100 per cent of those not yet completed.

It is of value to compare this class of airplane with the single-engined cabin airplanes, the data concerning which was recently given*, and with which they share the air transport of the world. In reviewing the smaller machines a selected list was used the averages for which are given in the present table and marked "selected small machines". The criterion in the case of the small machines was an F. M. greater than 2500 while in the case of the large machines the figure 3500 was used. This is somewhat contrary to general opinion as the large machines are regarded as less efficient than the smaller ones. This idea has sprung from military considerations, principally performance. The following table will show some of the primary relations between the two classes.

	Speed Range	*Pay L./hp.*	*Range*	*Figure of Merit*
All large machines	2.12	3.15	545	5278
All small machines	2.32	2.81	455	2666
Selected large machines	2.245	3.87	657	5131
Selected small machines	2.355	3.39	525	3773

It will be seen from the table that while the smaller machines have a greater speed range, the larger machines carry more pay load per horsepower a greater distance. Also that the selected small machines are only three miles per hour faster than the large ones. Generally speaking, the larger machines are more comfortable, due to larger cabins, and more reliable due to a multiplicity of power units. In regard to the reliability of the powerplant, there is a recent trend toward putting the engines inside the fuselage where they can be cared for by a mechanic. Out of the ten machines constructed or laid down in 1921, six are of this class. The Zeppelin E.4.250 is included as the engines may be worked on in flight, though in the wings.

The selected large machines contain those with F. M.s over 3500. It is interesting to see how the number changes as the determining F. M. is varied. There are 41 with F. M.'s greater than 1500, 37 over 2000, 30 over 2500, 24 over 3000, 17 over 3500, 14 over 4000, 8 over 4500 and 6 over 5000. The six over 5000 are: Airliner RB-1, Handley-Page W-8, Blackburn Pelican, Farman Goliath, Bréguet Leviathan and the five-engined Caproni. With the exception of the Blackburn and the Bréguet machines, which have not yet been built, all have been tested out in service and found satisfactory.

One-third of the American machines listed fall within the selected group. This is a strong indication of the ability of American designers who have been faced with an almost total lack of air transport in this country, due principally to the do-nothing attitude of the government which has consistently refused to either ratify the air convention or offer substitute legislation of its own. Such evidence should encourage those who are inclined to feel that aviation in this country has dropped far behind Europe.

The figures in the table given in *italics* were obtained indirectly, that is to say, they were calculated from other data. The principal bases employed were: Fuel consumption 0.50 lb./hp.-hr. Oil consumption in gallons, 1/20 that of the fuel. Weight of fuel 5.92 lb. per gal.; of oil 7.0 lb. per gal. Weight of crew 160 lb. per man. Where the endurance was given and the speed not stated it was assumed to be the maximum speed.

TABLE OF CHARACTERISTICS OF MULTI-ENGINED COMMERCIAL AIRPLANES

Make	Nation	Year	Class	Type	Model	Span ft.	Span in.	Length ft.	Length in.	Height ft.	Height in.	Engine Make & Model	Engine hp.	Engine No.	No. Pass.	Weight Empty lb.	Useful Load lb.	Pay Load lb.	Total Weight lb.	Wing Area sq. ft.	Power Loading	Wing Loading	Maximum Speed mph	Landing Speed mph	Range mi.	FIGURE OF MERIT
Curtiss	A	19	L	B	Eagle I	61	4					Curtiss K6	150	3	6	5130	2320	1149	7450	770	16.55	9.69	107	55	475	†
Lawson	A	19	L	B	C-2	91	0	48	0	15	0	Liberty 12	400	2	24	7517	6412	3683	13929	1797	17.42	8.17	110	*51*	*440*	4078*
Sundstedt-Hannevig	A	19	S	B	(Transatlantic)	100	0	59	6	17	7	Hall-Scott L6	220	2	*12*	*6080*	*3920*	*2400*	10000	1537	22.75	6.52	80	*46*	*400*	3415 *1)*
U. S. Aerial Mail	A	19	L	B	J-2	56	10	31	2	11	0	Hall-Scott L6	210	2	..	3787	1763	650	5550	604	13.21	9.20	105	53	*410*	1131
Aeromarine	A	20	X	B	75 (F5L)	103	10	49	4	18	9	Liberty 12A	350	2	11	8456	4367	*2525*	12823	1394	18.32	9.20	*85*	*53*	*370*	1926
Curtiss	A	20	L	B	Eagle II	64	4	56	7	12	11	Curtiss 012	400	2	8	5310	3380	1440	8690		10.86		124	*51*	750	†
L. W. F. Eng. Corp.	A	20	L	B	Owl	105	0	53	9	17	6	Liberty 12A	400	3	..	12600	7600	*3469*	20200	2200	16.83	9.18	112	*52*	*600*	3419
Lawson	A	20	L	B	L-4	126		62		18		Liberty 12	400	3	24	11990	8159	3570	20149	2425	16.79	8.85	112	53	800	4535*
Glenn L. Martin	A	20	L	B	Express	74	2	43	8	15	7	Liberty 12	400	2	..	6840	5160	3000	12000	1121	15.00	10.70	110	52	600	4284
Pacific Airplane & S. Co.	A	20	L	B	Hawk	52	0	32	0	10	8	Curtiss OX5	90	2	4	2630	1320	*600*	3950	656	21.94	6.93	82	47	*445*	2329
Thomas-Morse	A	20	L	B	MB-4	45	6	25	5	11		Hispano Suiza H	300	2	..	2890	2510	1500	5400	645	9.17	8.53	122	*51*	*550*	2960
Airliner Eng. Corp.	A	21	L	B	RB-1	64	0	41	2	18	0	Packard 1-A-2025	500	2	25	8121	6500	3500	14621	1323	14.62	9.00	110	50	*768*	5322 *2)*
Barnhart	A	21	L	B	Wampus-Kat	50	0	30	10	11	0	Curtiss OX	90	2	4	2611	1404	640	4015	485	22.31	8.18	*88*	*44*	*394*	2507
Friesley	A	21	L	B	Falcon	65	3	40	0	15	0	Liberty 12	330	2	12	5600	3000	*1920*	8600	897	13.03	9.59	120	*54*	*350*	2035
Boulton & Paul	E	19	L	B	P-8	61	0	40	0			Napier Lion	450	2		4000	3000	*1500*	7000	829	7.78	8.45	*152*	*51*	*450*	2012
Bristol	E	19	L	T	Pullman	81	8	52	0	20	0	Liberty 12A	400	4	14	11000	6750	2600	17759	1255	11.09	9.35	125	*54*	520	1760
Central Aircraft Co.	E	19	L	B	2A	63	6	39	3	12	6	Beardmore	160	2	8	3160	2240	*1350*	5400	895	16.88	6.03	85	38	*320*	2718
Grahame-White	E	19	L	B	Limousine	60	0	39	0	11	0	Rolls Royce Eagle 5	320	2	4	5785	2162	840	7947	735	12.42	10.96	116	50	*305*	836
Handley-Page	E	19	L	B	W-8	75		60		17		Napier Lion	450	2	15	6620	5380	3150	12000		13.33		112	45	*650*	5906
Vickers	E	19	L	B	Vimy	67	2	42	8	15	3	Rolls Royce Eagle 8	375	2	10	7300	5200	2890	12500	1380	16.67	9.39	110	45	*500*	4239
Beardmore	E	20	X	B	WB-9	107		61	0	20	6	Beardmore	200	4	10	9520	4480	1800	14000	2202	17.50	6.35	93	46	403	1650* *3)*
Blackburn	E	..	L	M	Pelican (Alula)	146		84		22		Napier Lion	460	2	..	13080	11020	7890	24100	1870	26.20	12.90	*101*	55	*490*	†
Bleriot	F	19	L	B	Mammoth	88	7	50	6	21	0	Hispano Suiza	300	4	21	8360	8240	*3436*	16600	1505	13.83	11.03	93	*54*	*585*	2590
Caudron	F	19	L	B	C-25	82	6	62	8	18	0	Salmson Z9	250	3	16	7490	4830	*2340*	12320	1670	16.43	6.38	102	*48*	*612*	3652
Caudron	F	19	L	B	C-33	51	3	30	10	9	10	LeRhone	80	2	3	1950	1090	*726*	3040	504	19.00	6.04	93	*44*	*558*	4816
Farman	F	19	L	B	Goliath (F-60)	91	10	48	5	16	5	Salmson Z9	260	2	14	4409	5819	4249	10228	1775	19.67	5.77	100	*40*	*450*	8273
Liore & Oliver	F	19	X	B		72	6	39	7	12	7	2HS150-1 Salmson Z9	260	3	4	5500	3100	*1310*	8600	970	15.36	8.87	93	*52*	650	2447
Voisin	F	20	L	T		124	8	78	1	17	9	Hispano Suiza	220	4	12	9921	4409	2425	14330	2153	16.28	6.66	87	*45*	264	1266
Breguet	F	21	L	B	Leviathan	83	6	46	0	16	5	Breguet-Buggati	425	2		5720	8150	*4370*	13870	1505	16.32	9.22	118	*50*	950	10374* *4)*
Latham	F	21	X	B		104		60		16		Salmson Z9	250	4		9810	6060	*2990*	17870	1940	15.87	8.17	101	*51*	621	3386
R. Saulnier	F	..	L	M		88	7	56	8	10	5	Lorraine Dietrich	370	3	16	9480	5952	2623	15432	1249	19.05	12.36	145	*52*	*574*	†
Aviatik	G	19	L	B	R-3	142	0	73	0	21	4	Benz	250	4	18	19836	7945	3972	27781		27.78		78	*50*	545	3039
Deutsche Flugzeug Werke	G	19	L	B	R-2	114	9	67	9	20	6	Mercedes	260	4	24	*18900*	*7600*	*3574*	*26500*	2895	25.48	9.15	*72*	*51*	*530*	1960 *5)*
Zeppelin	G	19	X	M	DoGs-I	68	11	50	2	22	11	Maybach	260	2	8	6614	2866	1763	9480	850	18.23	11.15	105	*50*	373	2390
Zeppelin	G	20	X	M	DoGs-2	73	10	53	0	22	11	Maybach	260	2	9	6801	3009	1917	9810	1033	18.87	9.49	112	*46*	373	3013
Zeppelin	G	20	L	M	E.4.250	101	8	54	2			Maybach	260	4	12	13382	5357	*2177*	18739	1141	18.02	16.43	132	*64*	*750*	3669
Zeppelin	G	21	L	M	DoG-1	68	11	41	0	10	11	B. M. W. 3a	185	2	8	5181	2425	1554	7606	861	20.56	8.84	112	*44*	466	†
Caproni	I	19	L	T		96	10	49	2	24	6	Isotta Fraschini V6	260	5	30	14000	11000	*6000*	25000	2600	19.23	9.64	105	*52*	*750*	6291 *6)*
Caproni	I	19	L	T		96	6	42	11	20	8	Liberty 12	400	3	17	8800	8900	*3400*	17700	2223	14.75	7.96	95	*48*	*520*	4138
Bastianelli	I	20	X	B	PRB-1	102	4	54	2	21	4	Isotta Fraschini V6	275	4		8818	7375	*1985*	16093	2217	14.52	7.26	105	*47*	994	3967
Caproni	I	20	X	T	Epoca	108	3	72	2			Liberty 12	400	8	100	30865	22046	*9646*	52911	7696	16.53	5.87	90	*41*	*540*	3216 *7)*
Ricci	I	20	S	B	R-1	85	9	42	10	13	10	Isotta Fraschini V6	260	3	10	6160	4760	*2720*	10920	1291	14.00	8.46	110	*51*	*440*	3499
Savoia	I	21	X	B	S-22	44	4	35	5	11	6	Isotta Fraschini V6	260	2	7	3748	1764	*564*	5512		10.60		139	*50*	*556*	2391
Fiat	I	..	L	B		68	11	43	6	14	9	Fiat A12	300	3	10	7040	3960	1870	11000		12.22		123	55	600	†
TOTALS & AVERAGES																										
Large Machines					44	83	11	49	8	16	4	24	841	3	15	8326	5330	2651	13566	1563	16.13	8.87	106	50	545	3500
Selectel Large Machines					17							14	869	3	16			3359	14666				110	49	657	
Selected Small Machines					18							12	304	1	6			1031	4671				113	48	525	

ABBREVIATIONS AND NOTES IN TABLE.

A—American
E—English
F—French
G—Germany
I—Italian
L—Landplane
S—Float Seaplane

X—Flying Boat
B—Biplane
T—Triplane
M—Monoplane
*—Designer's estimates
†—Experimental type.

1—Data from transatlantic example
2—As designed, now flying with 2 Liberty-12 400 hp.
3—Central engine room amphibian
4—Two Bugatti engines coupled together driving one propeller.
5—Data for civil machine estimated from military model.
6—Designed for Liberty-12 400 hp.
7—Tri-tandem triplane.
8—One tractor propeller.

"Who's Who in American Aeronautics"

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Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Edward Vernon Rickenbacker

RICKENBACKER, EDWARD VERNON, Automobile Business; born, Columbus, Ohio, Oct. 9, 1889; son of William Rickenbacker and Elizabeth Rickenbacker.

Educated: Public and high schools of Columbus, Ohio.

Professional: 1908-1910, Mechanical engineering; 1910-1913, automobile business; 1913-1917, motor racing and engineering; 1917-1919, Army Air Service; 1919-1921 automobile business.

Aeronautical Activities: Took up flying in Tours, France, Aug. 1917 and was ordered to active service on Front, Jan. 1918; American Ace, officially credited with destruction of 25 enemy machines.

Flying Rating: Military Aviator.

War Service: May 1917 to Feb. 1919.

War Honors: Croix de Guerre (French) with four palms; Distinguished Service Cross with nine palms; French Legion of Honor.

Member: Detroit Athletic Club; Aero Club of America.

Present Occupation: Automobile manufacturing.

Address: Rickenbacker Motor Co.; home, Detroit Athletic Club, Detroit, Mich.

Henry Abbey Jr.

ABBEY, HENRY, Jr., Commanding Officer, Mitchel Field; born, Lockport, N. Y., Sept. 13, 1887; son of Henry Abbey and Rebekah (Connelly) Abbey; married, Lucretia Miller, May 5, 1914.

Educated: Boys' Country School and Boys' Latin School, Baltimore, Md., Princeton University.

Aeronautical Activities: Student Pilot, Rockwell Field; Pursuit Training, Gerstner Field, April 1918; Officer in Charge of Flying, Chanute Field to Oct. 1918; Commanding Officer, Scott Field to Nov. 1919; Commanding Officer, 5th Aero Squadron to May 1921; Commanding Officer, Mitchell Field to date.

Flying Rating: Junior Military Aviator, Dec. 13, 1919.

War Service: 11th Cavalry, Aug. 1910 to Oct. 1913; 10th Cavalry, 1913 to 1917; Major, Air Service, 1920.

Member: Aero Club of America.

Present Occupation: Commanding Officer, Mitchell Field.

Address: Mitchel Field, Long Island, N. Y.

Clinton DeForest Youngs

YOUNGS, CLINTON DEFOREST, Manufacturer; born, Orangeville, Mich., April 30, 1878; son of Eugene D. Youngs and Amelia C. Youngs; married, Fannie M. Fenn, April 3, 1901.

Educated: Grammar and high schools.

Professional: Manufacturer of agricultural tools, 1902-1910; Vice President and Superintendent of Fenn Mfg. Co., 1910 to date.

Aeronautical Activities: Trained at various fields during War.

War Service: Commissioned 2nd Lieut., Air Service; detailed to Engineering Department as Officer in Charge of Aero Repair; had charge of assembly, repairing and testing of planes; commissioned 1st Lieut., 1918.

Present Occupation: Manufacturing.

Address: 567 No. Cochrane Ave., Charlotte, Mich.

Noel Chadwick

CHADWICK, NOEL, Industrial Engineer; born, Boston, Mass., Dec. 22, 1894; son of George Whitefield Chadwick and Ida May (Brooks) Chadwick; married, Elizabeth Young, July 12, 1919.

Educated: Noble and Greenough's school, Boston, Mass.; 1917, Harvard University.

Professional: Industrial Engineer with Webb, Kendall & Bruce, Inc.

Aeronautical Activities: First class for Dirigible Pilots, Akron, Ohio, 1917; Dirigible Officer, Naval Air Stations at Key West, 1918, Montauk, L. I., 1918; Cape May, 1919.

Flying Rating: Naval Aviator; Dirigible Pilot.

War Service: May 1917 to Jan. 1919.

Member: Harvard Club of Boston.

Present Occupation: Industrial Engineer.

Address: 145 University Road, Brookline, Mass.

Clarence C. Culver

CULVER, CLARENCE C., Student Officer, General Staff College; born, Milford, Nebr., Dec. 25, 1872; son of Brig. Gen. J. H. Culver and Ada I. (Davison) Culver.

Educated: Public schools, Milford, Nebr.; University of Nebraska.

Professional: In charge of meteorological station and electric service system of University of Nebraska while student at that institution; served with 3rd Cavalry, U. S. Volunteers in Spanish American War; entered Quartermaster Department in civilian capacity, serving therein in United States, West Indies, and Philippine Islands; Philippine Insurrection with Major General Lawton and Maj. Gen'l Arthur McArthur; 1904, promoted to 1st Lieut., Regular Army; 1915, Captain; 1920, Major and Lt. Col.; commanded United States Submarine Cable Boat, Cyrus W. Field, 1909 and 1910; detailed to aviation duty, Aug. 1915; assigned to Air Service, 1920.

Aeronautical Activities: With Harry M. Horton of New York, in Aug. 1910, conducted experiments in airplane wireless which resulted in successful transmission from airplane to ground; designed and built receiving apparatus used for these experiments; in personal charge of official altitude measurements in International Aviation Tournament, Belmont Park, Oct. 1910; in charge similar altitude measurements at International Aviation Tournament, Grant Park, Chicago, Aug. 1911; in 1915 and 1916 accomplished long distance radio transmission from airplanes up to 140 miles with 1/5 kilowatt power; devised means of insulating the sound of the tractor motor of the airplanes necessary to enable one to receive radio aboard the airplane and successfully exchanged messages between airplanes in flight; June 1916, with E. J. Simon, Radio Engineer, worked out design of an airplane radio telephone for use in flight; Aug. 1917, was sent to Europe to demonstrate American airplane radio equipment, and to investgate requirements American apparatus would meet; May 1918, instituted training in Voice Commanded Flying at Gerstner Field; 1918 and 1920 in general charge of all matters in the Office of the Director of Military Aeronautics and Chief of Air Service pertaining to radio and communications Air Service Activities.

Honors: Medal of Merit for Aeronautical Radio development, 1916; Medal of Merit for Aeronautical Radio, telephone experimentation, 1918; Certificate of Merit for Aeronautical radio activities, Aero Club of America, 1919; Distinguished Service Medal for development Aeronautical Radio and Voice Command Flying.

Member: American Institute of Engineers; American Meteorological Society; Aero Club of America; Army and Navy Club (Wash.).

Present Occupation: Student Officer, General Staff College, Washington, D. C.

Address: War College; home, Army and Navy Club, Washington, D. C.

James Hartness

HARTNESS, JAMES, Governor of Vermont; born, Schenectady, N. Y., Sept. 3, 1861; son of John Williams Hartness and Ursella (Jackson) Hartness; married, Lena Sandford Pond, May 13, 1885.

Educated: Cleveland Grammar School; M. E. 1910, University of Vermont; M. A. 1914, Yale University; LL.D. 1921, Norwich University.

Professional: President, Jones and Lamson Machine Co., Springfield, Vt.

Flying Rating: Certificate No. 555, Federation Aeronautique International by Aero Club of America, Aug. 16, 1916.

War Service: Food Administrator for Vermont; Chairman of the Committee of Public Safety for Vermont; member of the Commission that represented the United States Air Board at the Inter-Allied Aircraft Standardization Conference at London and Paris during the war.

Member: American Society of Mechanical Enginers; Society of Automotive Engineers; American Astronomical Society; Fellow, Royal Astronomical Society; Fellow, Royal Aeronautical Society; Aero Club of America; President, Aero Club of Vermont.

Present Occupation: Governor of Vermont; President, Jones and Lamson Machine Co.

Address: 30 Orchard St., Springfield, Vt.

Joseph Pierpont Skrdlant

SKRDLANT, JOSEPH PIERPONT, Aerial Transportation; born, Philadelphia, Pa., May 24, 1896; son of Prokop Skrdlant and Mary (Pokorny) Skrdlant.

Educated: Jefferson Grammar School; N. E. High School, Philadelphia; Williamson School, Pennsylvania.

Aeronautical Activities: Toronto University; Armour Heights, Leaside, Canada; Camp Hicks, Texas, 1917-1918; commissioned, Jan. 1918; trained on combat machines at Cirencester, England; instruction in wireless telephony at Oxford University; aerial combat and aerial gunnery at Marske-on-the-sea; joined the 62nd Squadron, R. A. F., Bristol Fighters, with which unit saw service in France, Belgium, and Germany; co-organizer of Aerial Navigation and Engineering Co.

Flying Rating: Flight Lieutenant, Royal Air Force.

War Service: Sept. 1917 to Jan. 1920.

Present Occupation: Vice President and General Manager of Aerial Navigation Co.

Address: Foster Bldg., Denver, Colo.; home, 4046 N. Sixth St., Philadelphia, Pa.

Joseph George Coffin

COFFIN, JOSEPH GEORGE, Physicist; born, Pittsburgh, Pa., June 14, 1877; son of Warren T. Coffin and Belle V. Coffin.

Educated: Public schools, Lausanne, Switzerland; College Chaptol, Paris; B. S. 1898, Mass. Inst. of Tech.; Ph. D. 1908, Clark University.

Professional: Assistant Physics, M. I. T., 1899-1900; Research Assistant, Clark University, 1900-1903; Assistant Prof. Physics, College City, N. Y., 1906-1907; Assistant Director, Director Aeronautical Research, Curtiss Engineering Corp., Curtiss Aeroplane and Motor Corp., 1918-1921; Physicist, General Laboratory, U. S. Rubber Co., 1920.

Aeronautical Activities: Researches in Aeronautics, wind tunnels, aeronautical balances, new airfoils, max-bowling ranges, absolute pressure gauge.

Member: Fellow, A. A. A. S.; Amer. Physical Society; Amer. Mathematical Society; Institute of Radio Engineers.

Present Occupation: Physicist, U. S. Rubber Co.

Address: 58th Street and 11th Avenue, New York City; home, 199 Elizabeth Ave., Hempstead, L. I.

Jack I. Grow

GROW, JACK I., Commercial Aviator; born, Pontiac, Mich., Dec. 6, 1893; son of Kasson L. Grow and Elizabeth Grow; married, Isabel Patrick, July 3, 1916.

Educated: Public schools of Pontiac, Mich.; Pontiac High School; Pontiac Business University; Cornell University.

Professional: Instructor, Aeronautics (Civilian).

Aeronautical Activities: Training S. M. A., Cornell University, 1918; training at Carruthers Field; instructor, Barron Field.

War Service: Oct. 1917 to March 1919.

Member: Aero Club of America; Aero Club of Pittsburgh (Chapter Member).

Flying Rating: R. M. A. (Pursuit Pilot).

Present Occupation: General Manager, Irwin Aircraft.

Address: Brunswick Hotel, Irwin, Pa.

Carl Vincent Vickery

VICKERY, CARL VINCENT, Agriculturist; born, Nov. 4, 1896; son of Fred A. Vickery and Hattie (Nearhood) Vickery; married, Mary Rasor, Oct. 16, 1920.

Educated: Grammar and high schools of Bellevue, Ohio; agricultural course at Ohio State University.

Professional: Since 1918 Farm management.

Aeronautical Activities: Ground work at University of Illinois; training at Barron Field.

Flying Rating: Reserve Military Aviator.

War Service: Dec. 27, 1917 to Dec. 13, 1918.

Member: Cleveland Aviation Club.

Present Occupation: Farm Manager.

Address: R. F. D. 7, Bellevue, Ohio.

Glenn D. Angle

ANGLE, GLENN D., Aeronautical Engineer; born, Imlay City, Mich., Jan. 5, 1891; son of Vernon E. Angle and Mary Edith Angle; married, Eleanor B Grantham, Sept. 6, 1916.

Educated: Imlay City and Pontiac, Mich. grammar schools; Pontiac High School; University of Michigan.

Professional: Chief draftsman, Welch Motor Car Co.; draftsman and designer, Oakland Motor Car Co., 1913-1914; experimental engineer, Thermo Vacuum Systems, 1915-1916; engine designer, Curtiss Aeroplane and Motor Corp., Buffalo, 1917; Engineering Division, Air Service, 1917 to date.

Aeronautical Activities: Assisted in the design of the Curtiss K-12 engines; supervised the design of the Universal Test Engine, Model W-1-A 750 hp. engine and W-2 1000 hp. engine.

Books: Airplane Engine Encyclopedia.

Member: Engineers Club of Dayton; Dayton City Club.

Present Occupation: In charge of Airplane Engine Design, Engineering Division, Air Service.

Address: McCook Field; home, 238 Delaware Ave., Dayton, Ohio.

Lewis Victor Heilbrunn

HEILBRUNN, LEWIS VICTOR, Instructor, University of Michigan; born, Brooklyn, N. Y., Jan. 24, 1892; son of Victor Heilbrunn and Matilda Heilbrunn.

Educated: Public school 16, Brooklyn; Boys High School, Brooklyn; A. B. 1911, Cornell University; Ph. D. 1914, University of Chicago.

Professional: Assistant, Zoology Dept., University of Chicago, 1913-1914; Associate, Zoology Dept., University of Chicago, 1914-1916; Instructor, Anatomy Dept., University of Illinois Medical School, 1916-1917; Instructor, Zoology Dept., University of Michigan, 1919 to date.

Aeronautical Activities: Flying instruction, 1917, Ashburn Field and Chanute Field; Issoudun, Dec. 1917 to Feb. 1918; 88th Aero Squadron, Feb. 1918 to Jan. 1919.

Flying Rating: Reserve Military Aviator.

War Service: U. S. Army, May 1917 to April 1919; Officers Reserve Corps, April 1919 to date.

War Honors: 3 citations for distinguished service.

Member: Fellow, American Assn. Advancement of Science; American Society of Zoologists.

Present Occupation: Instructor, Zoology Dept., University of Michigan.

Address: 517 Linden Street, Ann Arbor, Mich.

Charles Hampson Grant

GRANT, CHARLES HAMPSON, Aeronautical and Civil Engineer; born, Elizabeth, N. J., Nov. 20, 1894; son of David C. Grant and Gertrude H. Grant; married, Lillian May Browne, Aug. 15, 1918.

Educated: Pingry School, Elizabeth, N. J.; Stevens Preparatory School, Hoboken, N. J.; Princeton University; Mass. Inst. of Tech.

Aeronautical Activities: Since 1909 has built flying model airplanes; built and flew a monplane glider at fifteen years of age, later made numerous flights with larger biplane gliders; worked under Leoning at Sturtevant Plant, Jamaica Plain, Mass.; 1916, at Mineola as mechanic and designer; 1917, Princeton Flying School; 1918, assigned to Technical Section, Air Service, Washington, D. C.; later stationed at McCook Field doing design work; 1919, established a flying model manufactory in Dayton, the first one to turn out flying models on a production basis, as many as 400 per day.

Flying Rating: French Brevet Military Aviator.

Present Occupation: Aeronautical Research and Engineering.

Address: Irving National Bank, Lincoln Office, East 42nd Street, New York City; home, 5 Harbor Lane, New Rochelle, New York.

John Wickliffe Throckmorton

THROCKMORTON, JOHN WICKLIFFE, Accountant; born, Morristown, N. J., March 30, 1899; son of Charles Wickliffe Throckmorton and Charlotte Edgerton (Alvord) Throckmorton.

Educated: Hill School, Pottstown, Pa.; schools abroad and graduated Townsend Harris Hall, New York City, 1917.

Professional: Accountant, 1919-1921.

Aeronautical Activities: Flying training at Kelly Field and Fort Sill, Okla., May 1918 to Feb. 1919; exhibition flying and passenger carrying for The American Aeroplane Exhibition Co., Humboldt, Tenn., June to Aug. 1920.

Flying Rating: Reserve Military Aviator, Sept. 1918.

War Service: Army, March 1917 to Jan. 1918; Air Service, Jan. 1918 to July 1919.

Member: Knickerbocker Canoe Club, New York City.

Present Occupation: Accountant.

Address: 18 East 41st Street; home, 9 East 97th St., New York, N. Y.

Henry Stuart Hotchkiss

HOTCHKISS, HENRY STUART, Rubber Business; born, New Haven, Conn., Oct. 1, 1878; son of Henry L. Hotchkiss and Jane (Trowbridge) Hotchkiss; married, Elizabeth Wyndham Washington, Oct. 9, 1907.

Educated: Taft school; Philips Academy, Andover; Ph.B. 1900, Yale, Sheffield Scientific School.

Professional: President, General Rubber Co. of Brazil; Director, General Rubber Co., Ltd., London; President, U. S. Rubber Plantations, Inc.; Malayan-American Plantations, Ltd.; Director, Holland-American Plantation Co.; President, Naugatuck Chemical Co.; Rubber Regenerating Co.; Vice President, L. Candee & Co.; Director, Rubber Regenerating Co., Ltd., Great Britain; Director, U. S. Rubber Export Co.; Director, New Haven Gas light Co., New Haven Saw Mill Co., Chatham & Phenix National Bank, N. Y., Union and New Haven Trust Co., New Haven.

Aeronautical Activities: Assistant Chief, Inspection, Equipment Division, Signal Corps, Oct. 25, 1917 to March 21, 1918; Chief, Raw Material Production, Air Service, Oct. 4, 1918 to Jan. 25, 1919.

War Service: Captain, Signal Corps, Oct. 25, 1917; Major, Signal Corps, Jan. 28, 1918; Lt. Colonel, Air Service, Oct. 4, 1918; Senior Assistant Military Attache, American Embassy, London; served in France.

Member: Lotos, University, Yale and St. Anthony Clubs, New York; Graduates Club, New Haven; Counselor, American Geographical Society, New York; Fellow, Royal Geographical Society, London.

Present Occupation: President, General Rubber Co.

Address: 1790 Broadway, New York City; home, 55 Hillhouse Ave., New Haven, Conn.

Robert Coffin Hilldale

HILLDALE, ROBERT COFFIN, Lawyer; born, Philadelphia, Pa., Dec. 11, 1889; son of John A. M. Hilldale and Minnie D. (Coffin) Hilldale; married, Elsa Margaretha Muller.

Educated: Grammar school; Waltham New Church School; Temple College; LL.B and LL.M., National University (Law School); American University.

Professional: Assistant Secretary, American Institute of Child Life, 1912-1914; student-at-law, 1914-1918; Production Expert, Signal Corps, Aviation Sec., 1918; 1st Lieut., Air Service, 1918-1919; member of the Bar, District of Columbia, 1920 to date; member of law firm of Stovall & Hilldale, Munsey Building, Washington, D. C.

Aeronautical Activities: Associated with W. W. Montgomery, Jr., of Philadelphia, chief of the Legal Department, Bureau of Aircraft Production, where Aircraft Production contracts were negotiated and drawn and miscellaneous legal affairs of Aircraft Production handled; 1st Lieut., Air Service, Nov. 1918 to Oct. 1919.

Member: Washington Board of Trade; American Legion; American Society of International Law.

Present Occupation: Lawyer.

Address: Munsey Bldg., Washington, D. C.; home, Chevy Chase, Md.

Leland Wilbur Miller

MILLER, LELAND WILBUR, 1st Lieut., Air Service; born, Galesburg, Kans., Nov. 26, 1894; son of Robert Ellis Miller and Ada Moore (Denious) Miller; married, Marjorie Dee, March 7, 1919.

Educated: High school, Omaha, Nebr.; Electrical Engineering, Purdue University.

Aeronautical Activities: Ground School, Austin, Tex., Nov. 1917 to Jan. 1918; special mapping course, Rockwell Field, 1918; photographic and mapping work, 1918, 1919, 1920; bombing at Langley Field, 1921.

Flying Rating: Reserve Military Aviator, Aug. 1918; Airplane Pilot.

War Service: 1st Officer's Training Camp, Fort Snelling, Minn., May 1917 to Aug. 1917.

Present Occupation: Instructor, U. S. Army School of Aerial Photography.

Address: Langley Field, Va.

Llewellyn Bradley Peck

PECK, LLEWELLYN BRADLEY, Newspaper Editor; born, Shantung, China, Jan. 13, 1886; son of Dr. Albert Palmer Peck and Celia (Flagg) Peck; married, Lida P. O'Bannon, Nov. 28, 1918.

Educated: Pomona College.

Aeronautical Activities: Graduate of Army Balloon School and School of Military Aeronautics, Berkeley, Calif.

War Service: 1916-1919.

Member: Allied Fliers' Club.

Present Occupation: Assistant Editor, Berkeley Gazette.

Address: 2048 Center St.; home, 1169 Colusa Ave., Berkeley, Calif.

John M. Williams, Jr.

WILLIAMS, JOHN M. JR., Aeronautical Design; born, Greenwich, Conn., Nov. 13, 1890; son of John M. Williams and Hannah G. Williams.

Educated: Private schools, Greenwich Academy and Brunswick School; St. Pauls College, Garden City, L. I., N. Y., 1910.

Professional: Automotive Machine Co., 1914-1916; Experimental Engineer, Locomobile Co., 1917; designer, Wright Aeronautical Corp., 1920.

Aeronautical Activities: 1910, built monoplane glider; training at Love Field; engine designer 1920, Wright Aeronautical Corp.

Flying Rating: Reserve Military Aviator, Aug. 9, 1918.

War Service: Sept. 1917 to Oct. 1919.

Member: Society of Automotive Engineers.

Present Occupation: Design Section, McCook Field; Government Experimental Work.

Address: McCook Field; home, 210 W. 2nd Street, Dayton, Ohio.

Kenneth S. Clapp

CLAPP, KENNETH S., Manufacturing; born, Albion, Ind., Feb. 9, 1893; son of W. F. Clapp and Alice (Smith) Clapp; married, Gladys Pratt, Sept. 8, 1919.

Educated: Albion High School; A. B. 1916, University of Michigan.

Professional: Salesman, 1916; Public Accountant, 1916-1917; Manager, Wayne Oil Tank and Pump Co., Cleveland, Ohio, Jan. 1920 to date.

Aeronautical Activities: S. of M. A., Columbus, Ohio, 1917; R. F. C., 1917-1918; 27th Aero Squadron, U. S. A., 1918-1919; active service, A. E. F. with 27th Aero Squadron, 1st Pursuit Group, U. S. A.; Toul Sector, 1918; Chateau Thierry, St. Mihiel Salient and Meuse Argonne, 1919.

Flying Rating: Airplane Pilot.

War Service: As above.

War Honors: Croix de Guerre with Palm; Distinguished Service Cross.

Present Occupation: Manager, Cleveland office, Wayne Oil Tank and Pump Co.

Address: 1833 E. 13th Street, Cleveland, Ohio; home, 2223 California Ave., Fort Wayne, Ind.

Miner Carey Markham

MARKHAM, MINER CAREY, born, Ripley, N. Y., Oct. 6, 1896; son of Frank Manley Markham and Mary Grace (Miner) Markham.

Educated: Hamilton High School, N. Y.; A. B. 1921, Princeton University.

Professional: Newspaper Reporter, Albany New York and Toronto, Canada, 1915, 1916.

Aeronautical Activities: S. M. A., Cornell University, June to Aug. 1917; flying schools, Mt. Clemens, Mich., Mineola, L. I., Issoudon and Tours, France, 1917 and 1918; pilot, 99th Aero Squadron, June 1918 to March 1919.

Flying Rating: Reserve Military Aviator, Dec. 1917.

War Service: 1917-1919.

Present Occupation: Student at Princeton University.

Address: Princeton; home, Cobleskill, N. Y.

Arthur Douglas Farquhar

FARQUHAR, ARTHUR DOUGLAS, Insurance Business; born, Sandy Spring, Md., March 7, 1891; son of Allan Farquhar and Charlotte (Pleasants) Farquhar; married, Helen T. Nesbitt, Nov. 1, 1919.

Educated: Sherwood School, Sandy Spring, Md.; B.S. 1910, Kenyon College; Cornell University.

Professional: With Mutual Fire Insurance Co., 1912-1921.

Aeronautical Activities: Ground School University of Texas; training for Bombing Pilot in Italian flying schools.

Flying Rating: Reserve Military Aviator.

War Service: June 1917 to Dec. 1918; with 6th Italian Bombing Squadron of Capronis as pilot; commissioned 1st Lieut.

War Honors: Croce di Guerra (Italy).

Present Occupation: Insurance business.

Address: Sandy Spring, Md.

Robert E. Kennedy

KENNEDY, ROBERT E., Electrician; born, Pomona, Calif., Feb. 4, 1897; son of Michael C. Kennedy and Mary G. Kennedy.

Educated: High school and Pomona College, Pomona, Calif.

Aeronautical Activities: Army flying, March 1918 to Jan. 1919; flying for motion pictures; passenger flying in Texas.

Flying Rating: Reserve Military Aviator.

War Service: April 1917 to Jan. 1919.

Member: American Legion; Air Service Club of Southern California.

Present Occupation: Government electrician.

Address: Box 224, Soldiers' Home; home,, 307 No. Parke Ave., Pomona, Calif.

Promoting a Municipal Field

By Ralph B. Eckley

Commercial flying fields are such a new element in the business enterprise of American cities that definite and tried methods in their organization are little known.

Large cities find it quite easy to find the fifteen or twenty thousand dollars needed to properly establish a field. They can secure grants from the city council and from the government and rather large donations from prominent business men. In the smaller cities, however, upon which commercial aviation must largely depend to furnish the material for its business, there is a much different problem.

A number of towns from ten to forty thousand in population established fields shortly after the war and found no great difficulty in securing the funds necessary. At the present time progress is almost at a standstill in the establishing of fields in the smaller towns due to the money situation.

For the benefit of the aero clubs and city councils of the smaller towns, the following account shows how one town successfully established a field under very adverse circumstances.

Monmouth, Ill., is a small town in western Illinois about sixteen miles from the Mississippi river and about seventy miles south of Rock Island. It has a population of about eight thousand and is located in a rich farming district and known widely as a church and college town. The population is made up largely of tradesmen and retired farmers, with a few hundred factory men.

The proposition of a landing field was first proposed last July before the Exchange Club by Lois McMann, a "gypsy" flier. McMann proposed to lease a field and establish a school. Interest was aroused among the younger men of the organization and steps taken to begin the organization at once. The accidental death of McMann put a damper on the work for a week or so but the revival came when the Curtiss-Iowa Corp., hearing of the interest in a field, proposed to establish a subsidiary field, install a Curtiss Oriole and training plane, build a double hangar and provide service on the condition that a field was secured and fifteen thousand dollars raised.

A committee was named from the Exchange Club to cooperate with the Rotary Club and the Chamber of Commerce in raising the money.

The campaign opened with a big dinner for the workers. The Curtiss-Iowa Corp. sent representatives from Fort Dodge to the meeting in two planes, an Ansaldo six-seater, and an Oriole. The Mayor of Monmouth came from Fairfield, Iowa, another subsidiary field and arrived in time for the dinner. Great interest was shown in the two machines, both of which were new to Monmouth people. The success of the campaign was due to a great extent to the use of these modern machines.

The campaign opened with a rush and continued nicely for a couple of weeks until one night the Oriole made a forced landing and broke the undercarriage. The trouble was minimized by the fact that at noon the next day an exact duplicate arrived from Fort Dodge from the Curtiss Iowa Corp.

A great deal of effort was necessary to overcome the unfortunate publicity in Chicago papers with regard to a number of accidents in the air that occurred during the campaign. The local papers were excellent supporters of the sales work, publishing daily reports of progress, and running special articles in regard to commercial aviation.

Interest in the reserve corps of the Air Service and an attempt by Monmouth to secure a section in competition with a neighboring town added interest in the minds of the younger men, many of whom served in the air forces during the war.

The campaign was brought to a close on Oct. 12 after a campaign of about a month. Monmouth was assured a permanent field, equipped to supply gas and oil to touring planes and with a supply of repair parts for emergencies.

Passenger carrying is to be the main business of the company, who expect to start work on the substantial double hangar at once. A training plane with an expert pilot will be available at all times for school purposes together with an Oriole for passenger work.

Monmouth is one of the two towns between Chicago and Omaha on the Burlington route, the second being Fairfield, Iowa, about seventy miles west. Monmouth is 180 miles from Chicago and would be glad to have all aviators on a western trip stop at her field, which is just north of the town and due north about a mile of the college campus. Repairs and service will be available at all times.

Commercial Aviation in France

During the course of an interview with a correspondent of the London *Morning Post*, M. Laurent Eynac, the French air minister, remarked that the development of aviation in France, especially commercial aviation, has been most remarkable lately. There are already organized six regular aerial lines for the carrying of goods and passengers and, so far as air transport is concerned, France is ahead of all other nations. In May next a new aerial line, Paris to Amsterdam, will be inaugurated.

Aircraft are especially useful on account of the saving of time, M. Eynac stated. Thus, it takes more than nine hours to go from Paris to London by train and boat, but by taking the aerial mail one can be in Regent street four hours after having left the boulevards. By air, Brussels is only two hours and a half from Paris, and Strasbourg only three hours and a half. Prague is seven hours from Paris, and one can reach Morocco after a thirteen hours' flight, while the most rapid ship takes four days. Railways take ten hours to go from Bayonne to Bilbao; a motor-car will make the same journey in five hours, but a seaplane unites the two towns in 55 minutes.

Another factor of paramount importance to the future development of aircraft is that of security. The results already obtained entirely guarantee the security of passengers. During the year 1919-1920 1,180,603 miles have been covered by the flight of French airplanes. Of this total there were only seven killed and seven wounded, that is to say, an average of one killed and one wounded per 105,633 miles flown. Consequently, it is not surprising to notice the constant development of aerial transports in France. The transport of passengers has greatly developed. Only 960 persons travelled by air in 1919; the number of passengers amounted in 1920 to 6,750. The carrying of goods has similarly progressed; 27,800 lb. were carried by machines in 1919, while the total commercial transport amounted in 1920 to 227,739 lb. This last figure includes a great many parcels sent from Paris to London by the dressmakers and milliners, who utilize the plane extensively in making their deliveries. The value of their consignments on the line Paris-London during the year 1920 exceeded 16 million francs, and this figure will be largely surpassed this year.

Curtiss Eastern Airplane Corp.

The Curtiss Eastern Airplane Corp., distributors for Curtiss airplanes and motors for the southern part of New Jersey and the States of Pennsylvania, Maryland and Delaware, have taken over the Curtiss Flying Station at the Inlet in Atlantic City, N. J.

This station will be run under the direct management of the Curtiss Eastern Airplane Corp. and will be kept open all year round for passenger carrying, aerial photography and sports purposes. They will also keep a large stock of spare parts on hand and will be able to handle any work such as repairs and overhauling that will be necessary.

Aviation in China

By Major De Senn Chung, C. A. S.

The history of aviation in China commenced in 1910, when a Russian pilot made the first historical exhibition in the Chinese capital, Peking, with a Blériot monoplane at the Legation Quarter. As it was the first airplane ever flown in China an unusually large throng was attracted from great distance. The usefulness and importance of aviation was soon realized by the Chinese government, and in the same year the general staff of the Chinese army in Peking selected a place about ten miles from the city known as Nan Yuan for establishing an experimental flying field. As common in all other scientific undertakings, little results were obtained in the beginning on account of the lack of skilful technical persons. Just one year later, a French aviator, Mr. Vallon, flew with a Sommer biplane in Shanghai. His wonderful skill and daring feats attracted nation-wide attention, but in attempting to surprise his curious Oriental spectators with so many forms of hair-raising stunts in the air, he was unfortunately killed by accident. This would undoubtedly discourage many people as to the practicableness and usefulness in future aviation. However, a bad beginning does not necessarily mean a check to its advancement, and as a matter of fact aviation has been making a great headway in China ever since.

COMMERCIAL VIMY AIRPLANE, USED BY THE CHINESE AERONAUTICAL DEPARTMENT, AT NAN YUAN AIRDROME, NEAR PEKING

The Early Beginnings

During the Revolution of 1911, in which the Manchu monarchs were overthrown, the revolutionary leaders planned to attack Peking from the air and two Etrich monoplanes were ordered from Austria, but on account of transportation delays, they failed to arrive until the revolutionary turmoil was over. About that time the first Chinese aviator returned from England, and was the first Chinese to make several successful flights in Shanghai, while down in Canton, another Chinese pilot returned from the United States with a biplane, but was accidentally killed in a flying exhibition. Being the first Chinese victim of an airplane accident, his death was deeply felt all over the whole country.

In 1913 the first aviation school in China was established at Nan Yuan now known as the Air Service Flying School, under the auspices of the general staff with the assistance of some French aviators. Twelve Caudron biplanes were purchased in France by the Chinese government for instructional purposes, and a factory well equipped with modern machinery which was mostly imported from Europe and America, was also established to be used for repairing aircraft. The school was managed by a carefully selected staff of Chinese and French instructors with the assistance of several French aeronautical engineers. The flying cadets were appointed from among the young officers of the army and navy. On account of the repeated internal disturbances, both politically and socially, and the numerous civil wars, many interrruptions were caused in the school and consequently, for the first several years, only a few of the students were actually graduated as qualified pilots.

Following the example of the army, the Chinese naval board began to turn its attention to naval aviation as early as 1916 with the establishment of a naval flying school at the immediate vicinity of the Foochow navy yard. Unlike the air service flying school at Nan Yuan, it was entirely under the management of Chinese instructors, and among the latter several were returned students, who acquired their aeronautical training in the American universities and private flying schools. Several seaplanes, equipped with American made engines, were constructed and were used solely for instructional purposes. In the last two years the activities of the school were frequently interrupted on account of financial difficulties, and also by lack of supplies caused by the Great War. It was recently reported that the Chinese naval board has exerted every effort to reorganize the school and several young capable Chinese pilots have already been ordered by the government to report there as instructors.

In the winter of 1919, aviation made its epoch in China with the organization of an aeronautical department for the purpose of controlling and unifying the entire air service of the country. Since airplanes could not be manufactured in China with much success, contracts were signed with the Handley Page and Vickers companies by which the Chinese government agreed to purchase from the two firms 150 airplanes for training and commercial purposes, and further agreed to employ for the time being a staff of foreign experts as pilots and instructors. It was also agreed upon between the Chinese and British governments that these airplanes shall be used for no other purposes than for training and commerce, their military usage being in particular forbidden. Before the arrival of these machines technical experts were recommended by the British war ministry to assist the Chinese aeronautical department. The first chief of the Chinese air service was General Tinn, under whose wise and efficient leadership aviation has already made a headway which is promising for the future. He is a man of remarkable ability, with great aeronautical enthusiasm, but for some reason he was compelled to resign, and his successor is now General Pon.

American Trained Chinese Fliers

Ever since 1914, young Chinese aviators have been returning to Canton by the score from the United States, where they obtained their flying experience. They proved their skill and ability as qualified pilots in several minor civil strifes between different military leaders in bombing as well as scouting and

reconnaissance, and gained the confidence of the people as to the practicability of aviation both in military and commercial enterprises. Great enthusiasm is being shown by the progressive people of South China toward aviation. Regular air squadrons have been organized for training and military operations under capable and experienced young Chinese pilots. In spite of the lack of material and supplies, and often financial difficulties, aviation is making a remarkable advancement in Canton, perhaps surpassing all other aviation enterprises in China.

Further zealous interest was aroused in aviation by the conspicuous visit of the two Italian aviators, Lieutenants Masiero and Ferrarin, in May 1920, who left Rome on Feb. 16 and landed at Peking on May 17, covering a distance of nearly 10,000 miles. They were highly honored with several meritorious decorations by the Chinese Government and were also well entertained by many high local officials including the President and his cabinet. After remaining in Peking for one week, they departed amidst great ceremonies to complete their Rome-Tokio flight. To express its desire of encouraging aviation in China the Italian government presented an airplane to the Chinese government. This machine is now exhibited in the National Museum of Peking. These daring visitors with their wonderful success and courageous achievement undeniably made a deep and lasting impression on their Chinese friends.

At that time, aviation in North China was more or less under the hands of foreigners. Upon the wise suggestion of the officers of the aeronautical department, a call was sent out to all the Chinese diplomatic representatives for all Chinese students studying abroad, who have any experience in aeronautics. Many students, both fliers and engineers, promptly answered the call and eagerly returned home to render their services to their country. In the meantime, several young officers sent out to Manila, P. I., several months previously by the naval board returned home qualifying themselves as pilots. Seeing a great need of more trained aviators, the aeronautical department recently sent several more young officers to the United States for advance training. With all her foreign trained pilots it is hoped that China will soon manage her own aviation completely and efficiently.

Peking-Shanghai Air Line

Aviation is making great progress in China, particularly in the past few months both in the North and the South. Several air lines have been inaugurated with unusual success. The most notable one is the Peking-Shanghai air line, covering a distance of 800 miles. It is undoubtedly true that commercial aviation is a feasible enterprise in China because of her neglected railroad system and the lack of modern transportation. Agreement has already been reached between the ministry of communications and the aeronautical department as to the carrying of mails and valuable parcels by the latter department. Commercial Vickers "Vimy's" are used in flying these different air lines for the conveyance of passengers and mails. The minimum rate charged per letter is 15 cents, and passengers are carried at the rate of approximately 25 cents per mile. With such bright prospects, it is possible that China will soon be covered with a net of air lines in every direction, whereby her four hundred millions of inhabitants would become closely connected together, as never had been before.

The air service flying school at Nan Yuan, which is directly under the control of the aeronautical department, will be depended upon to supply the future aviators of China. Avro's with dual controls are exclusively used for instruction. The number of cadets is limited to fifty, half of whom are in the observer class, while the other half is receiving instruction in flying daily with the exception of Saturdays and Sundays. The faculty consists of well trained Chinese, English, American and French aviators. In a few years, China is expected to produce a large number of capable and experienced aviators to the aviation world. Beside their training in the flying field, the cadets attend classes, in which they receive courses in mathematics, foreign languages, meteorology, aerial photography, wireless, and other subjects which are essential to all aviators. The cadets are carefully examined quarterly by

Prior to the inauguration of the air line between Peking and Shanghai, the aeronautical department has established a school for air service administration, which answers the purpose of providing competent administrators for the airdromes to handle the new business. The first class, comprising thirty students, was mostly chosen from members of the staff in the department. The courses of study give them the necessary and elementary knowledge in air service administration, and the term is only for three months. Upon the completion of their courses, they will be sent to take charge of the different stations. At the same time, the technical section of the aeronautical department has been authorized to establish a class for the training of a large number of technical workers.

Seventy-five students are under instruction and these, after proving themselves proficient and having fulfilled the requirements, will be detailed to the different airdromes for duty.

Beside performing its work as a flying school, the air service flying school of Nan Yuan is conducting an aerial touring service every Sunday, Thursday and Saturday between Nan Yuan and Peking, a distance of about eleven miles. The planes in use are the Vimy Commercial type and three trips are made during each tour. It was a great surprise to find among the passengers many distinguished officials as well as many prominent ladies. The object of this aerial touring service is not for the sake of financial accomplishment, but the real underlying purpose is to arouse the people's interest and to demonstrate to them that riding in an airplane is no more risky and dangerous than riding in an automobile in a crowded street, and that aviation will not be thought of as a mysterious affair. Most recently a funeral in Peking was attended by over half dozen of airplanes, which was the first time in Chinese history for airplanes to participate in such a ceremony.

No one could deny the fact that China owes a debt of gratitude to France, England, and the United States for the unselfish and friendly assistance these countries rendered in the development of her aviation. There is sufficient evidence to show that the Chinese can learn the art of flying with extraordinary skill and rapidity. It will be only a short time before China will produce many efficient and able aviators.

All of the airplanes used in the North of China are of English manufacture. The Vickers company alone has supplied China with 100 Avro's and about forty commercial Vimy's. The airplanes used down in Canton are mostly of American manufacture, with the exception of a few European machines. The Chinese government is now bending every effort toward the establishment of an up-to-date aircraft factory, capable of producing a large number of high class airplanes within a short notice, if necessary. It has been found that all parts of an airplane could be readily manufactured in China with the exception of the engines on account of the lack of proper metal supplies, and modern machinery.

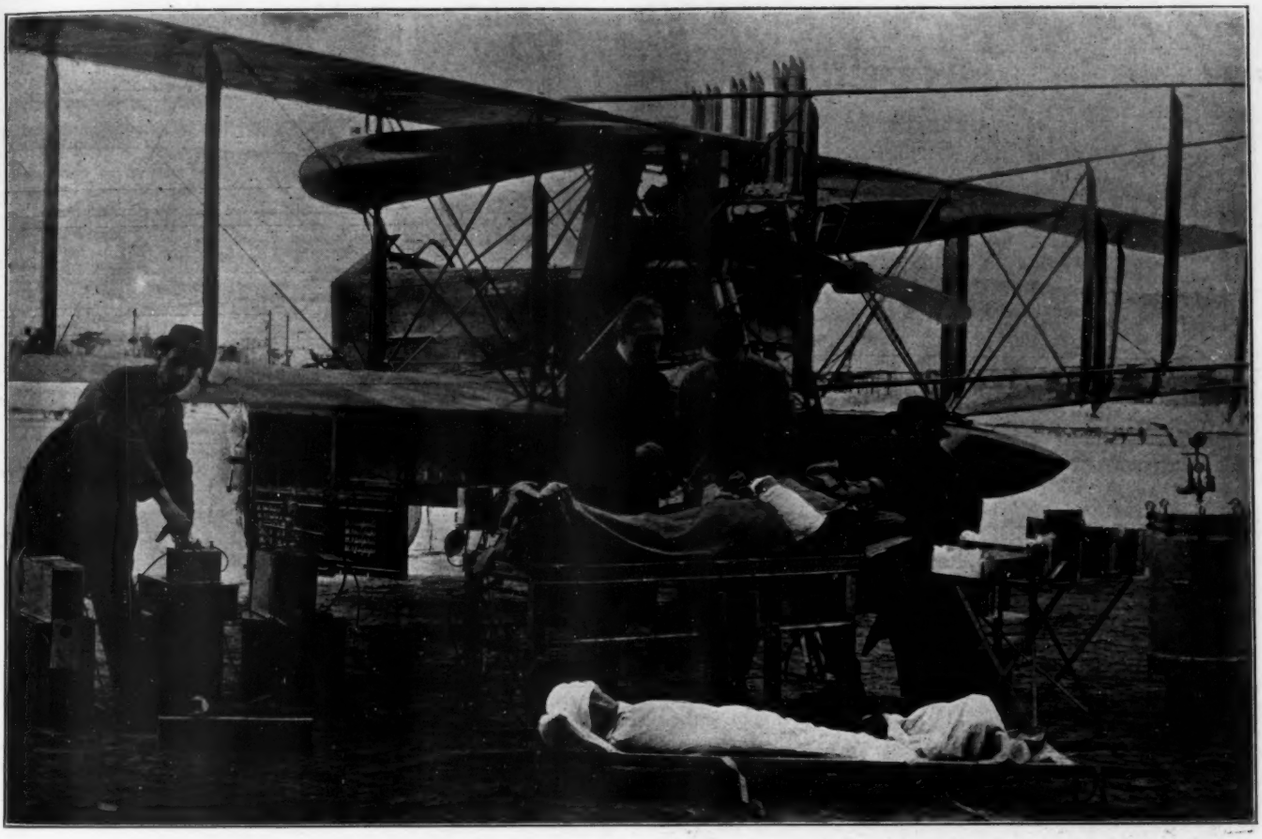
China Signed Air Convention

As one of the signatory powers, China joined the air conference held in Europe, during the peace conference, with her minister to England as the representative. Regulations in regard to air navigation have been drawn up by the aeronautical department with the approval of the President. All the regulations are strictly enforced, and the violators will be duly punished by law. As an instance, if one flies over Peking at an altitude below 3,000 ft., one may be fired upon by the city police.

Beside the airplanes owned by the government, there are a few others under private ownership down in Canton. However, they are subject to be called into government service in case of need. Their owners often give exhibitions in large cities and instruction is also commonly given to persons who desire to learn the art of flying. A few days ago, it was announced that through the generosity and kindness of the French government, an airplane of the Caudron biplane type was presented to the Chinese government. The machine will be transported to Nan Yuan to be used in the air service flying school for the instruction of its flying cadets. With the hope of raising the interest in aviation to the highest pitch, the Aero Club of China was recently organized under the leadership of many prominent officials.

A French Surgery Airplane

By George F. Paul



THE VOISIN SURGERY AIRPLANE "AEROCHIR" AND ITS EQUIPMENT

A Voisin biplane specially equipped with surgical apparatus for rapid field work has been developed by a French inventor, M. Nimrovsky of Paris, who has called the machine thus equipped the "Aerochir". The war emphasized the great necessity of getting surgical aid to distant and isolated spots at the earliest possible moment. Many trial flights have been made with the "Aerochir", with a view to determining the possibilities of development in this line of first aid. The machine is capable of carrying, in addition to the pilot, a surgeon and a radiologist, who can assist the surgeon; besides it carries in special receptacles all of the apparatus and equipment needed for successful surgical work in the field.

The machine can furnish the current for the X-ray work. The sterilizing outfit can be run in the same manner or from a storage battery. The X-ray table is light, being made of aluminum, and can be folded up.

The plan of the inventor is to have one or more of these machines at important centers within a given zone from which they can cover their districts. Thus each machine can bring linen, compresses, cotton bandages, etc., as well as other supplies such as soap, ether, serum or vaseline, in addition to the surgical instruments, all properly sterilized and ready for use. A supply of sterilized water, varying in quantity according to the size of the receptacles provided, can also be furnished.

The working outfit comprises such essentials as a folding washbowl, an operating table, two small round table stands, two electric heaters for sterilizing the instruments, a large vessel for water, two enameled basins, an instantaneous hot-water heater, etc. On reaching the scene of the emergency the surgeon, with the assistance of his helper and the pilot, will soon be thoroughly prepared to perform any operation that may be required. With this equipment it will be possible for operations to be performed quickly, relieving the patient of protracted suffering and greatly increasing the probabilities of recovery.

It repeatedly occurs that persons who have met with injuries either in battle, industrial accidents, railroad wrecks, or otherwise, cannot be removed to advantage to a central hospital or even to a first-aid station. A dozen things may make the removal impractical. In such an emergency the aircraft that can bring the equipment of the operating room direct to the patient will prove of the greatest practical value and will perform a mission worthy of the name of modern science.

More Bombing Tests with U.S.S. Iowa

The old battleship Iowa will be taken south for gunnery exercises during the winter maneuvers with the Atlantic and probably the Pacific Fleet, in Panama Bay between Feb. 27 and March 6. She will proceed south with the Atlantic fleet early in January, either under her own steam or be towed by an auxiliary vessel.

Arriving at Panama Bay she will be adjusted for radio control and during the week set aside for the special gunnery tests, it is understood that she will again be subjected to aerial attacks from the aircraft of the Atlantic Air Squadrons which accompany the Fleet. Whether or not live bombs will be used on this radio controlled warcraft, the only one in existance, is not yet determined as the detailed plans for the gunnery exercises have not yet been announced by Admiral Hilary Jones, Commanding Officer of the Atlantic Fleet.

Hardin Package Parachute at World Series

Three baseballs autographed by Home Run King Babe Ruth were dropped by Mrs. Ruth just before the third World Series game from an Aeromarine Airways H.S.2-L flying boat by means of a Hardin parcel-carrying parachute. Each of the three baseballs bore a message. One was signed by Mrs. Ruth and addressed to her husband. The other two were autograhped by Mayor Hylan and C. F. Redden, president of the Aeromarine Airways, Inc.

Mrs. Ruth pulled the parachute release at an altitude of 3000 ft. when directly over the Polo Grounds. The folded

MRS. GEO. H. RUTH, PILOT D. G. RICHARDSON AND CINEMA OPERATOR ON BOARD AN AEROMARINE HS-2L FLYING BOAT

chute and container enclosing the baseballs shot out from the metal carrier and the chute opened perfectly, but in its descent a strong wind carried it outside the grounds, where through a strange coincidence and without any prearrangement it was picked up by an agent of Keiths Palace Theatre, New York, who placed the chute and baseballs on exhibition as an advertisement for the theatre. The coincidence lies in the fact that Babe Ruth has been booked by the Keith Circuit for a vaudeville stunt and opens at the Palace Theatre this fall.

The same Hardin parachute by arrangement with the Hardin Parachute Co. of Minneapolis will be placed on exhibition throughout the cities of the Keith Circuit as an advertisement for the Babe Ruth act. This incident will no doubt suggest to others the many advertising and publicity uses to which package dropping parachutes may be put.

Inter-Island Air Service for Hawaii

That an inter-island airplane mail and passenger service may become a reality was indicated by a letter received recently by the Honolulu Chamber of Commerce from Mr. C. A. Webb of San Francisco, who asked for particulars regarding the possibility of establishing an aerial line between the islands. The line would handle mail and papers, with a few passengers. According to Mr. Webb, he would use 6-passenger flying boats.

Thomas-Morse MB-7 Monoplane

The cover illustration of this issue shows the latest product of the Thomas-Morse Aircraft Corp. of Ithaca, N. Y., the Thomas-Morse Model MB-7 monoplane.

The machine is to be flown in the Pulitzer Race by Col. H. E. Hartney, executive secretary of the Aero Club of America. Colonel Hartney tested the machine last week at Ithaca and expressed himself as highly pleased with its performance. While it is not yet permissible to make public the high speed attained in these tests, it may be said that the Thomas-Morse MB-7 monoplane promises to be one of the fastest machines that will compete for the Pulitzer Trophy.

The general specifications of the machine are as follows:

SPECIFICATIONS OF THOMAS-MORSE MB-7

Span	24 ft.
Overall length	18 ft. 6 in.
Maximum height	7 ft. 5 in.
Chord	5 ft. 6 in.
Total wing area	112 sq. ft.
Engine	400 hp. Wright
Propeller	8 ft. 2 in. dia.
Weight loaded	1975 lb.
Wing loading	17.6 lb./sq. ft.
Power loading	4.95 lb./hp.

Duralumin Nails for U. S. Navy G.B. Seaplane

A special type of double clinch nail made of heat treated duralumin is being used exclusively for fastening together the hull planking of the Giant Boat now being built at the Philadelphia Navy Yard. These nails take the place of the copper clinch nails generally used for this work and, in addition to being lighter, have been found to drive more satisfactorily than copper nails. The breakage and faulty settings of duralumin nails are much below those of the copper nails, an advantage which was not anticipated beforehand.

The duralumin nails were developed by A. & D. R. Black for the Navy Department and are heat treated during manufacture so that the material remains perfectly ductile when the processes are completed. While the nails are supplied in this form and can be driven without further treatment, a final treatment is given just before the nails are driven in the hull. This treatment takes advantage of the peculiar properties of duralumin and softens it for sufficient length of time to permit driving several hours run of nails with more ease than copper nails. After setting, the material in the nails gradually hardens of itself developing considerable strength and, at the same time, a very high resistance to corrosion by sea water. These unusual properties make the duralumin nails particularly satisfactory for hull construction.

On account of the success of the experiments with clinch nails of duralumin tests are now being made with applications of this material to other uses in aircraft construction not previously considered.

Commended for Gallant Conduct

The Secretary of the Navy commended Charles Harrison Broom, Chief Machinist's Mate, U. S. Navy, on duty at the U. S. Naval Rigid Airship Detachment, Howden, Yorkshire, England, for his gallant and heroic conduct following the accident to His Majesty's Airship R-38 (ZR-2) on Aug. 24, 1921, at Hull, England.

Following the explosion, to which Broom was a witness, he proceeded to the scene in a tug boat, and on arrival, swam to the wreckage, entered the sinking ship which was filled with explosive gases, by means of the after gun tube, and proceeded to search for members of the crew inside the keelway. After struggling through the wreckage, partly swimming and partly clambering over girders, he succeeded in recovering the body of Flight Lieutenant Montague, Royal Air Force, which he passed outside the ship to a small boat. Returning inside, he again took up the search for others, and it was only by great presence of mind that he managed to jump clear of the ship as she turned over, and swim to a small boat.

Undaunted, Broom still continued his search for the bodies of those lost in the wreck, until becoming exhausted from his exertions and exposure, he was ordered on board a tug, not however, before the tide had risen and the wreck was submerged.

Completion of Flying Training at Post Field

One of the most thorough courses of flying yet recorded any class of student flyers in the history of the United States Air Service terminated at Post Field on Sept. 15, when the summer term of the Air Service Observation School, which commenced on April 25 last, was brought to a close, with a total of forty-two flying officer graduates, all of whom were at once reported to the academic board convened at this station as ready to be recommended for rating as airplane pilots. Eight field officers are included in the list of graduates.

Including time in the air as observers on practice tactical missions, the pilot books of the officers graduated show an average total of approximately 130 hr. flying time each which, when distributed over a period of but little over five months, gives a clearer idea of the amount of flying required of each student to complete the curriculum of advanced flying training at this school. The above figure is, of course, exclusive of flying time accumulated at primary Air Service schools, which will average about 70 hr. for each pilot, giving a grand total of approximately 200 hr. in the air before the student flyer was considered ready for the much coveted rating of Airplane Pilot.

A comparative value of the above figures, which helps to indicate that the ideal of peace time air training is *thoroughness,* may be obtained when it is remembered that, under the stress of war requirements, many pilots were operating successfully on the Western Front before they had gained a total air experience of as much as 50 hr. In many cases, particularly in the Royal Air Force, 30 hr. or even less would cover the total instruction and practice time of flying officers prior to their first trip over the lines, while the average useful life of a pilot in actual war service missions on the Western Front, measured in hours of flying time in contact with the enemy, was computed as considerably less than 100 hr.

Ten hours of formation practice in DH-4 Liberty machines was made a part of the advanced training curriculum for each pilot of the present class at Post Field. A further idea of the thoroughness of practical flying experience gained by each of the present graduates before being reported as ready for rating is gained from the fact that the cross country training of the class as a whole involved a grand total of approximately 127,000 miles which, divided among the class of forty-two student flyers, gives an average of over 3000 miles for each pilot on cross country flying alone, all of which was carried out during the final month of the course. Several organized cross country flights, with formations in some instances including up to fifteen machines, were flown by student officers to destinations varying in distance of from 200 to nearly 500 miles.

The numerous individual cross country missions involved were in almost every instance thoroughly successful, and served to demonstrate in the most practical way the ability of the student to navigate his course under all conditions of weather and varying terrain, operate from unfamiliar and often quite unfavorable fields, and to exercise practical resourcefulness in the care and repair of both ship and motor without assistance from the home station.

Five student officers of those who enrolled in the Air Service Observation School on April 25, 1921, failed to complete the course, and there were two fatalities among student officers incidental to flying.

XB-1A Airplanes to be Operated

The Commanding Officer of the San Antonio Air Intermediate Depot has received orders to set up immediately ten XB-1A airplanes, which will be assigned to a squadron at Kelly Field to be designated by the Commanding General of the 8th Corps Area. This being the first time that this equipment is to be operated in the Air Service, special pains will be taken to see that the necessary detailed reports are secured, in order that an accurate historical record may be obtained and such other information gathered as may be of value to the Engineering Division at McCook Field in the development of future equipment. Cross-country flights in this airplane will be prohibited until the necessary testing about the airdrome has proven satisfactory.

Italian Air Appropriation

For the fiscal year ending June 30, 1922, the Italian government has appropriated 42,700,000 lire for the Army Air Service and 22,060,000 lire for Civil Air Service, both services being under the jurisdiction of the War Department.

With regard to the appropriation for military aviation, the largest sum is alloted for the renewal of aviation material (16,500,000 lire). Next in order is 13,000,000 lire for gasoline, oils, etc. For expenses incidental to the preparation of flying personnel 4,800,000 lire is allotted; maintenance of buildings and airdromes 2,200,000 lire; special compensation to flying personnel, 2,400,000 lire; conducting experiments of aircraft and aircraft armament, 2,050,000 lire; repair and maintenance of planes, motors, and other material, 1,300,000 lire; aerial photography, 150,000 lire; and miscellaneous expenditures, 300,000 lire.

Of the appropriation for civil aviation, 4,500,000 lire is allotted as subsidies to private aeronautical concerns for the operation of airdromes and aerial routes by heavier-than-air and lighter-than-air craft; 2,300,000 for carrying out studies and experiments; 3,000,000 lire for construction purposes; 2,460,000 lire for the operation of a preliminary flying school; and the remaining 7,200,000 for miscellaneous purposes. An additional appropriation, not yet determined, is to be allowed the Civil Air Service for the construction of commercial airplanes.

The salaries of army personnel are paid out of other appropriations for the support of the army. Many of the airdromes are also supported from funds appropriated for the maintenance of army posts. It is estimated that the Army and Civil Air Services receive from other appropriations to cover various services such as maintenance of posts, pay of the army, etc., 50,000,000 lire, making a total sum to be expended for military and commercial aviation in Italy during this fiscal year of approximately 112,760,000 lire, or slightly over $28,000,000.

Transportation of Injured Man on Wing of Airplane

One of the most unusual cases on record of the transportation of an injured man by airplane has just come to light in a report to the Navy Department from the commander of the Fourth Air Squadron, Marine Corps, in Haiti.

Recently an urgent call was received in Port au Prince, Haiti, requesting aerial transportation for the case at Maissade, in the inland jungles of that island, to the hospital at Port au Prince on the coast.

Lieut. Kenneth B. Collings, a Marine flying officer, at once started for Maissade in a DH4B plane. On his arrival, however, he was met with a problem. Transportation of wounded and sick by air is a common thing in the island, where roads are rudimentary and at times bandid-infested, but this case was special. The injured man was badly mangled so that he had to be put in splints from head to foot, and accordingly could not be carried in the usual way, upright, in the cockpit of the machine. His condition was critical and hospital attention was urgent.

The injured man was accordingly bandaged to the eyes, given a special face mask, wrapped securely to a six foot plank, with a blanket, given a helmet and goggles, and lashed to the wing of the machine, close to the fuselage. The bulk of this bundle on the wings made the flying "rather difficult", the report commented. It required 35 min. to make a trip that otherwise would have taken hours, or even days, of jolting and travel.

Ringing up a Plane

The entire British fleet of airliners in regular use between London and Paris is now equipped with wireless telephones, and during their aerial journeys the machines are in constant communication with the ground stations.

It is no uncommon thing to hear while "listening in" at a ground station the pilot of an incoming air express speaking to the pilot of an outgoing machine and advising him of peculiarities of the weather along the route.

Kokomo Flying Meet

A general feeling of optimism with regard to the future of aeronautics in this country prevailed at the flying meet held in Kokomo, Indiana, Sept. 22 to 24, by the Curtiss-Indiana Co. More than fifty airplanes of various types were on the field, among them being a Fokker D-8, a Farman FE2B Bomber, a Morane Parasol, SE5's, JN4's, etc.

E. A. Johnson and J. E. Rae flew their FE2B to the meet from their home field in Dayton. The ship was used during the war for bombing. It has a Beardmore motor, a four-bladed propeller, a nachelle with capacity for four passengers, and is capable of lifting great loads and making long flights.

Mr. Johnson expressed gratification over the season's business, stating that the firm has been selling ships and making money. He believes that there is a great future ahead of them and that next summer will do much to develop aeronautics. Mr. Rae was quoted as saying that it is the speed of airplanes that is going to build up this business. It takes five hours' travel from Kokomo to Chicago by train, and this distance can be flown in one hour and 15 minutes. That is what the people of this country want.

Buck Weaver and E. M. Laird flew to the meet from Wichita, Kansas, in their "Laird Swallow". Mr. Laird stated that his factory is running full time, business being good and plenty of ships being sold. The general depression one hears about so much does not seem to have affected his business. According to Buck Weaver, "the people in the West are crying for faster travel. They want the train schedules torn up—and they are going to have it. They will pay gladly if they can save time".

Tampa's New Aviation Field

Benjamin Park Aviation Field, Tampa, Fla., was officially opened on Sept. 18 and the event was marked by an interesting program of entertainment. A considerable part of the personnel from Carlstrom Field, including Major Royce, Commanding Officer, and Lieut. Col. Wm. E. Gillmore, Chief of the Supply Group, Office Chief of Air Service, were in attendance.

Major Royce and Colonel Gillmore were the first to land on the new field, and shortly afterwards six other planes made their appearance and one by one glided down to the field. When the pilot, passengers and mechanics of the seven planes had landed they were escorted by automobile out to Temple Terrace, where a reception committee, headed by M. C. Fowler, took the aviators and city officials in charge. A drive over part of the Temple Terrace acres was followed by an informal dinner on the edge of the Hillsborough river. Following the dinner, L. P. Dickie, Secretary of the Board of Trade, as toastmaster, introduced Mayor Brown, who welcomed the Carlstrom aviators and paid a tribute to the part aviation is playing and will play in the development of the country. Major Royce then responded on behalf of the flyers.

George W. Benjamin, donor of Benjamin Park, then expressed his gratification at the opportunity of seeing the progressive strides which Tampa is making.

Lieut. Colonel Gillmore made a short talk, in which he told of the progress of aviation. "The government spent $33,000,000 for aviation purposes last year," he said. "This year our appropriation has been cut down to $19,000,000. Of this amount $6,000,000 will be spent for developing purposes alone."

Municipal Flying Field for Honolulu

There is a possibility that Honolulu may have a municipal flying field in the near future if arrangements can be effected whereby Honolulu Park may be extended to embrace an aera 600 ft. long and about 200 ft. wide.

Maj. Gen. Wm. P. Summerall, Department Commander, who with Brig. Gen. Joseph E. Kuhn made an inspection of possible landing fields in the vicinity of Hilo, stated that with the extension of Honolulu Park, as indicated, and the necessary preparation of the ground a hangar would be erected on the field and a detachment of enlisted men assigned for duty thereat.

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